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THE METAL INDUSTRY

WITH WHICH ARE INCORPORATED
THE ALUMINUM WORLD: COPPER AND BRASS: THE BRASS FOUNDER AND FINISHER
ELECTRO-PLATERS REVIEW

MAY 10 19

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STEVENS DETROIT

ntents Text Page 203 Buyers' Guide Advertising Page 77

In the city of Chicago *alone* over 1200 Traffic Signals *are finished with* EGYPTIAN Lacquer

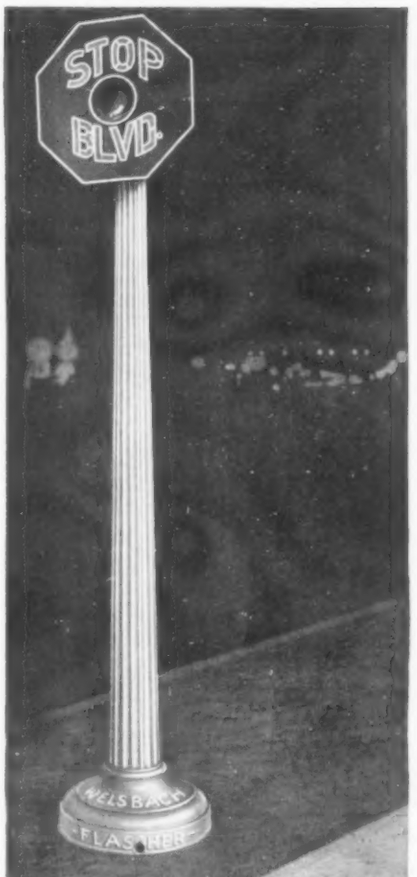
EGYPTIAN LACQUER looks soft and smooth as velvet yet wears like iron. Driving rain—grinding mud—baking sun—nothing seems to harm the rich, lustrous surface of Egyptian Lacquer. Heat or cold—water or weather—does not affect it. Acids and alkalis leave it unmarked.

All over the country countless metal signs, bronze tablets, wood and metal surfaces—indoors and outdoors—are finished with Egyptian Lacquer. Wherever durability as well as beauty is required—Egyptian finishes are specified. In the city of Chicago alone, over 1200 traffic signals are finished with Egyptian Lacquer.

Our service department will be glad to tell you more about Egyptian Lacquer—or fill any special "prescription" you may require.

* * * *

National advertising of Egyptian Lacquers is appearing regularly all during 1927 in The Saturday Evening Post. It will strengthen your sales talk to be able to add "It's Egyptian finished."



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The maker who is proud of what he makes, uses Egyptian Lacquer

THIS SYMBOL is the Egyptian Lacquer trade-mark. Its central figure is that of MAAT, *the Egyptian Goddess of Truth.* It typifies the integrity with which all Egyptian Lacquer products are made ...their precision, balance and true quality...the fidelity with which Egyptian Lacquers meet the particular needs of the manufacturer who seeks true beauty, fine finish and permanent protection for the products that he makes.

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THE EGYPTIAN LACQUER MFG. CO., INC., 90 West Street, New York

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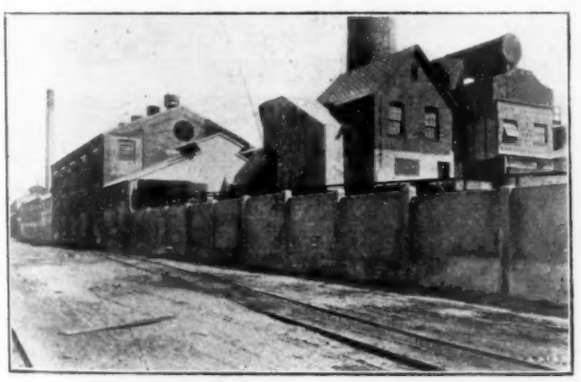
Vol. 25 NEW YORK, MAY, 1927 No. 5

Irvington Smelting and Refining Works

A Precious Metal Smelter and Refinery Handling High Grade Materials, and Specializing in the Platinum Metals. Processes Include Treatments by Blast Furnace, Converter, Cupels, Electrolysis, Roasting, Leaching, and Other Reduction Treatments

Written for The Metal Industry by ADOLPH BREGMAN, Managing Editor

The Irvington Smelting and Refining Works, originally known as the Glorieux Smelting and Refining Works, was established in Irvington, N. J., about forty years ago. This plant employs about 120 men at the present time, and is engaged in smelting precious metal-bearing materials, from which are recovered silver, gold, platinum, and the platinum metals. The copper with which these metals are usually associated is turned out as Bluestone.



GENERAL VIEW OF SMELTER BUILDINGS

RAW MATERIALS

The raw materials treated are either primary, such as copper concentrates resulting from mining and milling operations where precious metals are associated with the copper, or secondary, such as jewelers' sweeps, copper bullions, matte, copper suphides containing silver or gold, and a great variety of waste materials that carry values.

Other incoming materials are coke, limestone, pyrite and pyrite cinder, for the blast furnaces, also coal, fuel oil and sulphuric acid. Fuel oil is stored in a 72,000-gallon tank located above ground from which it is pumped to a 1,000-gallon tank for use in the plant. Sulphuric acid, 60° Bé is stored in four horizontal steel tanks holding a total of two carloads.

SAMPLING

The sampling of fine materials is done by the coning and quartering method. Bullions and other metallics are sampled by drilling or by melting and granulating in water.

In the sampling room is installed an exhaust system leading to a small Cottrell precipitator, which recovers the dust from the air exhausted. The main purpose is to keep the room under suction, so that no dust-laden air will find its way to the outside atmosphere or to other parts of the plant.

SMELTING OPERATIONS

Sweeps and other fine materials are charged into a pug mill in which they are mixed with water before moving to the blast furnace. Slaked lime is added to this mixture as a binder, when the materials are such as would tend to cause excessive flue-dust during smelting. The water used in the pug-mill is waste solutions from other parts of the plant, and contains some platinum by-metals which otherwise might be lost, or recovered only with difficulty.

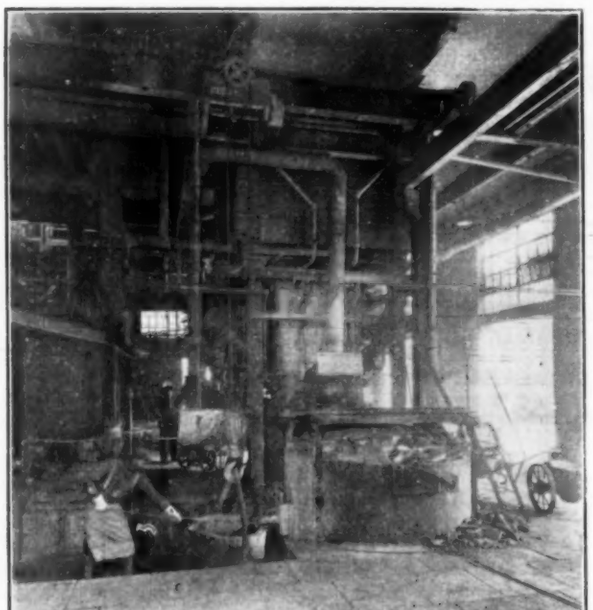
The highest grade of sweeps, concentrates and similar materials, and also rich copper bullions, are smelted di-

SMELTER YARD SHOWING SLAG POTS

rectly in the cupels or "test" furnaces. The lower grade bullions are charged directly into the converter. The test furnaces handle also various rich products from other operations in the plant, as noted later on.

There are three blast furnaces, two having a capacity of 30 tons each per 24-hour day, and one of 50 tons. The latter is arranged for use in conjunction with a small basic-lined converter for producing copper shot from the matte delivered by the furnace.

Sweeps of medium grade and other materials adapted



BLAST FURNACE AND SETTLER

to blast furnace treatment are usually smelted with lead as a carrier, in the blast furnaces, the lead being supplied by including litharge (lead oxide) in the charge. A typical blast furnace charge of this nature includes:—

Muddled (mixed with water) materials, such as Sweeps, concentrates, etc.
Leady matte from previous charges.
Fluxes (limestone, gypsum, pyrite cinder, or slag high in iron).
Litharge (if lead is to be used as carrier).
Return slag, as ballast.

From the lead bullion resulting from such a charge, the precious metals can be recovered promptly, and the litharge returned to the blast furnace for re-use.

When running leady charges the lead bullion is tapped from the lower of two tapping spouts in the crucible of the blast furnace, receiving the lead and matte together in conical iron pots. The matte forms an upper layer in the pot, solidifies quickly, and is removed with a chain link which has been partly inserted while the matte was yet molten. The lead is then ladled out into pigs.

Lead is not used in the blast furnace charge when the materials for treatment would produce matte in their own right, merely by smelting down. In such cases the furnace is run, not as a lead furnace, but as a straight copper matting furnace; the precious metal values are collected in the resulting copper matte, and eventually are found in the copper shot produced therefrom in the converter. When such materials are being smelted, it is found economical to include in the charge low grade sweeps or other materials which of themselves would not produce matte, and which otherwise would have to be smelted separately with lead. In this way the expense of recovering these values from lead bullion is avoided, and their cost of reduction is brought more nearly in range with the low return that the smelter receives for their treatment.

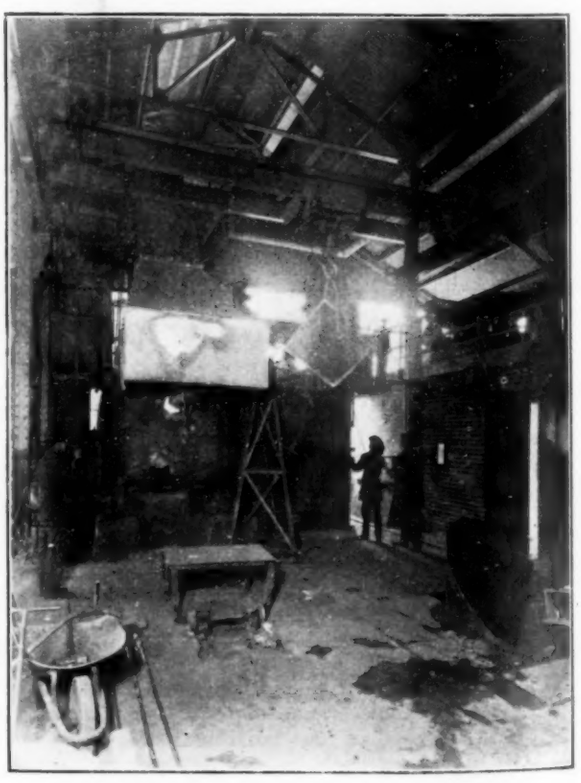
The lead collector method recovers a part of the precious metal values of the charge more quickly than when copper matte alone is used as collector, but the recent tendency has been away from the use of lead, and in favor of copper matte as collecting agent.

When copper matte alone is produced, it is tapped from the 50-ton furnace into an oil-heated settler or fore-hearth, from which it is tapped at intervals and taken in a cast steel ladle to the converter, which has a capacity of 7 tons of copper per 24-hour day. The leady matte likewise reaches the converter eventually, after it has been used over and over repeatedly until the quantity on hand has become too large to hold.

In the converter the sulphur and any iron and lead contained in the matte are substantially removed, yielding a final product high in copper and containing the gold, silver, etc., that had been in the matte. The copper is then poured off through a launder into a pit of water, in which it is granulated into shot form.

Of the converter slag, which is high in iron, the cleaner portions are reserved for blast furnace flux, while the dirty or more highly metallic portions are run down in one of the blast furnaces into the form of 200-lb. blocks which like the low grade bullions, are charged into the converter along with molten matte.

When the blast furnace is doing this kind of work the slag produced is very high in iron, hence a good opportunity is afforded to dispose of brick cobbing or other accumulations of silicious materials that contain values Notwithstanding such additions, the resulting slag is usually basic enough to hold for use as flux on other charges, thus lessening the purchases of iron flux from outside. With the converter slag it is customary also to smelt



CONVERTER RECEIVING MOLTEN MATTE

cement copper from scrap iron tanks that receive waste copper solutions from other parts of the plant, as this material is not adaptable for treatment in either the copper matte or lead charges.

Another advantage attached to this method of treating converter slag lies in the fact that certain metals occurring in the plant as impurities become concentrated to a considerable extent in the metal blocks, which can then if desired be subjected to a refining operation for their removal. This is true of nickel as an impurity, and the scheme might be applicable to other metals also. Nickel thus removed is recovered as single or double salts for use in the plating industry.

The smelting plant includes also two oil-fired tilting furnaces, which can be used to cast anodes or to remelt metal for producing shot.

Air is supplied to the blast furnaces and the cupel furnaces by a turbo blower, and two positive-pressure blowers are held in reserve. The warm water from the blast furnace jackets is held to maximum temperature and minimum volume by thermo-static control, at the furnace, and is afterwards pumped to boilers and other parts of the plant for use where required, thus utilizing both the water and the heat. Thermostatic control and recorders of various kinds are in liberal use throughout the entire works.

Materials are transported between all parts of the plant over an industrial track system, using a gasoline locomotive for haulage.

BLUESTONE PLANT

The copper shot made by the converter is charged into lead-lined tanks, in which it is treated with steam, air, and sulphuric acid solution, whereby the copper is taken up as sulphate in solution, leaving behind the precious metal slime. The solution when heavily charged with copper sulphate is passed through filter-presses to remove any sediment, and then is run into crystallizers made of concrete with acid-proof brick for lining, or wood with lead lining. In them are hung lead straps, and when the crystals have deposited upon these straps and upon the sides of the tank, the mother liquor is siphoned off and the crystals are removed and placed in containers.

The bluestone is then washed and dried in a centrifuge, after which it passes through a trommel screen for sizing into large and small crystals before barrelling. A special granular bluestone can be made by running either of the above through a pulverizer.

The mother liquor from the crystallizers drains to a sump from which it is pumped automatically as required, to an overhead tank. Sulphuric acid and water are then added as needed, and the acid solution is passed again through the shot tanks, thus completing the cycle of operations.

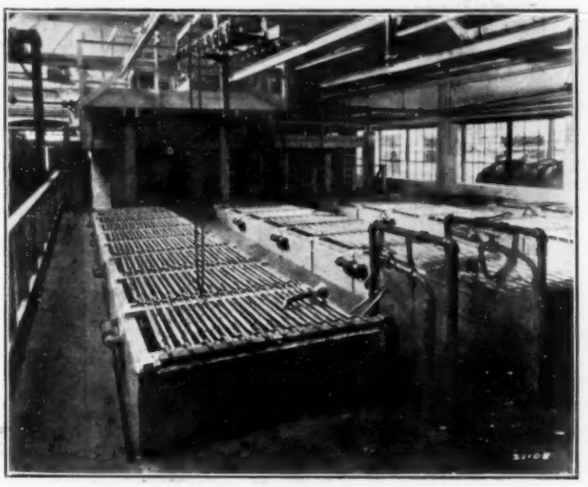
The slimes remaining behind in the copper shot tanks are taken out, roasted, leached with sulphuric acid in lead-lined mechanical agitators to remove copper, and after filtering are sent to the cupel furnaces. The filtered solution, which then carries copper, is sent to the mother liquor sump, or to the scrap iron tanks in case it contains impurities.

Not only is every care taken to keep impurities from getting into the bluestone, but the conditions of manufacture are favorable for turning out a high grade product. In plants that refine large tonnages of copper by electrolysis impurities accumulate in the electrolyte to a degree that requires its periodical or gradual replacement, and this fouled electrolyte is used for bluestone manufacture. Such is not the case at Irvington, where the nature of the process is of itself conductive to a clean product, the raw materials being pure sulphuric acid and relatively pure copper, all of which is converted into sulphate.

The acid treatment of converter copper has been found preferable to the electrolytic refining process, because of the difficulty to obtain clean cathode copper when anodes carrying high values have to be used. This factor in favor of using the bluestone process is very marked.

COPPER LEACHING AND ELECTROLYSIS

Three lead-lined mechanical agitators are provided for sulphuric acid leaching of roasted materials. The copper solution, if free from impurities, goes to the bluestone plant, otherwise it is decopperized using insoluble lead grid anodes. When nickel is present the resulting copper-free solution is used for the production of nickel salts for



LEACHING AND ELECTROLYTIC PLANT

the plating trade. The leached residue is subjected to smelting processes for recovery of precious metal contents, while the cathode copper is sent to the bluestone plant.

The electrolysis is carried out by the parallel system, and current is supplied by two motor-generator sets, each of 1,500 amperes capacity at 30 volts.

CUPEL FURNACES

Lead pigs or lead bullion from the blast furnaces are charged into oil-fired cupel or "test" furnaces where they are subjected to melting and air oxidation. Litharge is formed as a liquid floating upon the molten lead, and is allowed to overflow into pots or molds. This litharge, being lean in precious metals, is returned to the blast furnace as before described. The silver bullion remains behind in the hearth of the test furnace and when enough has accumulated the feeding of lead bullion is discontinued, the lead remaining in the bath is driven off and the silver, then comparatively free of lead but carrying gold and the platinum metals, is ladled out into molds.

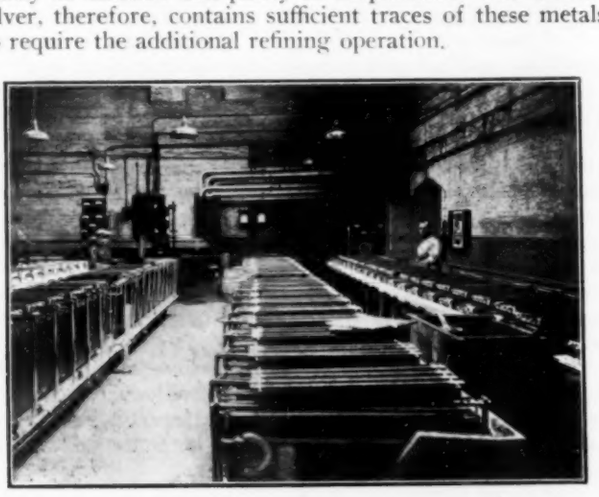
If the silver bullion is low in gold and platinum metals, anode molds are used and the anodes are sent to the electrolytic silver department. If, however, there is a large quantity of contained gold and platinum metals, the bullion is cast into thin slabs for the parting process, in order to expedite the recovery of the gold and also because the presence of excessive quantities of platinum metals renders the material poorly fitted for the usual process of silver electrolysis.

As already noted, the test furnaces handle also certain original materials, such as high grade bullions and concentrates, and rich slimes from other departments, hence much of the values contained therein enter the silver bullion and are subject to prompt recovery.

No lead is refined in this plant. A small amount of lead is lost, little by little, through gradual exit in small quantities in slag and fume. This is automatically replaced by the lead contents of some of the incoming materials.

PARTING PLANT

The parting or separation plant consists mainly of several cast iron kettles heated by oil burners. Here the silver bullion is treated with boiling sulphuric acid, the fumes from which are exhausted through hoods above the kettles and pass to an acid Cottrell installation to prevent pollution of the atmosphere. The resulting silver sulphate solution is decanted off from the residue, which consists of gold and the platinum metals. This residue then goes to the Wohlwill electrolytic refining department. The silver is removed from the sulphate solution by cementing out on copper sheets; the cement silver then is melted, cast into anode form and electrolyzed. This further refining by electrolysis is necessary because of the fact that platinum by-metals are present and show some tendency to go over with the silver sulphate solution, partly in solution and partly in suspension. The cement silver, therefore, contains sufficient traces of these metals to require the additional refining operation.



ELECTROLYTIC SILVER REFINERY

THE ELECTROLYTIC SILVER REFINERY

The electrolytic silver refinery has been improved and remodeled within the past few years and its capacity increased to about 700,000 ounces of silver per month, without enlarging the installation. Silver nitrate is used for electrolyte, and the silver anodes are wrapped in muslin sacks to hold the slimes. Mechanical rakes, constructed and operated in a simple and effective manner, in accordance with a patent owned by the Company, are used to brush or break off the longer silver crystals as they form upon the cathodes. These fall to the bottom of the cell, and at regular intervals each cell is emptied and cleaned. The silver crystals taken from the cell are washed, dried in a gas-fired rotating furnace, and after melting in crucibles are poured into bars ready for the market.

CUPEL FURNACE INSTALLATION

The slimes left in the muslin sacks contain gold and other precious metals and are sent to the Wohlwill department for further refining, in the same manner as the gold and platinum metals obtained from the parting.

WOHLWILL GOLD REFINING DEPARTMENT

The raw material received consists of "sponge gold" residues from the parting process and slimes from the silver refining process. These are melted, cast into anodes, and electrolyzed with direct current at about 15 volts, in an electrolyte of gold chloride solution with some free hydrochloric acid. The tanks are of white porcelain and are set into a steam bath under a hood. The resulting cathodes are fine gold and are melted and cast into bars for the market, but the slimes which consist largely of silver, gold, and some platinum by-metals, are reserved for further treatment. Platinum and palladium enter the electrolyte, from which they are subsequently recovered.

ROASTING EQUIPMENT

Roasting is done by means of a mechanical Wedge roaster, 16 ft. in diameter with 5 hearths, and 2 hand roasters, one of which is of the double-decker type. The hand roasters can be used for burning metal-bearing filter cloths and similar residue, in addition to doing the work of roasting electrolytic slimes or concentrates for which all the roasters are intended. Such roasted or burned ma-

terials are sent to the blast furnace or to the cupel furnace, depending upon their character, or are treated to a leaching process in lead-lined mechanical agitators.

COTTRELL FLUE DUST RECOVERY

The main Cottrell installation which recovers flue dust from most of the plant consists of three units with a total capacity of 20,000 cubic feet of gas per minute. The original installation was of the vertical pipe variety; corrosion troubles proved serious with this construction, and it has been changed recently to the "graded resistance" type, using reinforced concrete plates.

LABORATORIES

The plant maintains two laboratories. One of these is devoted especially to the precious metals and to all work relating to purchases; the other to plant control and to research on special problems of process improvement or of new processes. Among recent investigations of this kind, may be mentioned the development of methods for the elimination of antimony, which in the presence of large quantities of platinum by-metals it is not practicable to remove by standard methods.

POWER PLANT

The boiler room contains two Smith 165 h.p. boilers and two Keeler 200 hp. boilers. The method of operation of the power plant is briefly as follows: High pressure steam is produced from which electric power is obtained by means of Corliss engines, and A.C. generators. The exhaust steam from these engines, of course at low pressure, is sent out to various parts of the plant to provide the large quantities of process steam required for heating solutions. Extraordinary savings have been made in expenditures for coal and power by using the low pressure exhaust steam in this manner, and for heating the buildings. It has been found much more economical to operate in this fashion than to provide only low pressure steam for processes and buy all the power required.

MAINTENANCE

The plant has a well equipped maintenance department, including a carpenter shop and general machine and repair shop. A first-aid room is provided and the safety organization is active in reducing risks about the works.

GENERAL CONSIDERATIONS

The main reason for the existence of a plant such as this is not the recovery of copper or the manufacture of bluestone, but rather the recovery of precious metals,—gold, silver, platinum, and the platinum by-metals. Copper as such can be recovered more economically by the large copper refineries, while bluestone is essentially a by-product which ordinarily would prove unprofitable unless, as here, its production is in conjunction with and secondary to some other process.

Treatment of materials for recovery of the platinum by-metals is a specialty at this plant. For this purpose their works are especially well adapted not only by reason of their equipment and processes, but also by the fact that their operations are carried on upon a scale that is not excessively large. Elusiveness is a characteristic of the platinum by-metals and they have a strong tendency to circulate and gradually get lost in finished or intermediate products. Therefore, when introduced into a large copper or lead smelter or refinery their recovery, if accomplished at all, will be disappointing, long-delayed and costly. In a smaller plant such as the one at Irvington, which contains these metals in relatively larger quantities, special processes for these metals are justified, are more readily practicable, and have a far better chance for making successful recoveries.

On account of the great variety of small lots of material of high value received in this plant, the question of assays and umpires is a vital one. If settlements are even slightly too high a loss instead of a profit will result. The life of the industry depends upon the accuracy of the assays.

A great help to the customs smelting and refining industry in general would be umpires controlled by wholly disinterested agencies such as the Chamber of Commerce or the State or Federal Government, as is the case in some European countries. Such agencies should never act as representatives of buyer or seller, nor should they derive any income from buyer or seller, other than from umpire work.

PLANT IMPROVEMENTS

During 1923-4 extensive alterations and some additions were made to the plant, resulting in improvement in processes and more economy in operation. In common with other plants the works at Irvington had felt the effect of increases in cost of labor and materials and decreases in the margins from which revenues were derivable, which together with the fact that the plant was not new, made radical changes desirable.

Of these changes the chief one was relocation of the converter, which was moved from its former place to a position near the blast furnaces. The converter itself was not new equipment at this time, as it had been installed earlier to replace the old Welsh process, but its relocation was a step that resulted in more flexibility of operation, less tie-up of values, greater production with less expense for labor and supplies, and less periodic fluctuation in the number of men employed.

Improvements were made in the Wohlwill equipment so that a larger output of gold was secured from a smaller installation. In the electrolytic refining of silver and in the generation of power and steam, substantial betterments were put into effect as previously described.

A new building was erected for an enlarged and improved cupel furnace installation, and by replacing coal firing with oil on these furnaces further economies were effected. Additional roasting facilities were provided in this building as well, and in an adjoining building the leaching and electrolytic plant previously referred to was put up for treatment of roasted materials.

In the Bluestone Department some difficulty had been experienced in taking care of increasing accumulations of copper. By providing effective means of cleaning the surface of the copper shot, thus facilitating its solution, and by other means such as various automatic devices, the productivity of this installation was greatly increased without enlarging the plant or adding greatly to the attendance required. This operation greatly decreased the tie-up of values in slimes adhering to the copper shot, and opened the door to the more extensive use of copper as a collector for the precious metals.

These various improvements in processes and equipment have made it possible to handle an increased volume of business, and this is done with a present force of 120 men as compared with a former requirement of about 170. Business now handled would have been at a distinct loss, or impossible of consideration, except for the policy that resulted in these steps being taken.

The president and treasurer, Charles Engelhard, 30 Church St., New York City, gives enough time from his many interests to take active charge of the affairs of the company. The business offices are at Irvington, N. J. F. Coester is secretary; E. L. Jorgensen, superintendent of the plant, and Albert Meyer and Robert F. Wood, assistant superintendents, constitute the operating staff and contributed the data used in this article.

Alloys of Precious Metals and the High Frequency Induction Furnace

Manufacturing Dental Alloys from Waste Materials by the Aid of This Type of Electric Furnace. Concluded from Our April Issue

Written for The Metal Industry by REGINALD V. WILLIAMS, Williams Gold Refining Company, Buffalo, N. Y.

It can be seen that owing to the great number and variety of these gold-platinum complex alloys, their melting, casting and manufacturing represents a most difficult and interesting problem. Fusing points are quite high. They absorb abnormally large amounts of gases. The volumes are small consequently they solidify in a moment or so and the component metals vary widely both in fusing points and specific gravities.

CASTING PRACTICE

In following modern practice, every effort was made to determine definite and most satisfactory casting temperatures. When these temperatures were determined, after a long series of castings, most of which were repeated several dozens of times, temperatures were recorded and a casting schedule strictly adhered to. This work resulted in considerable improvement of the cast billets and fewer complaints from unsatisfactory finished materials. Melting temperatures in some instances were the very highest obtainable in the standard gas furnace equipment.

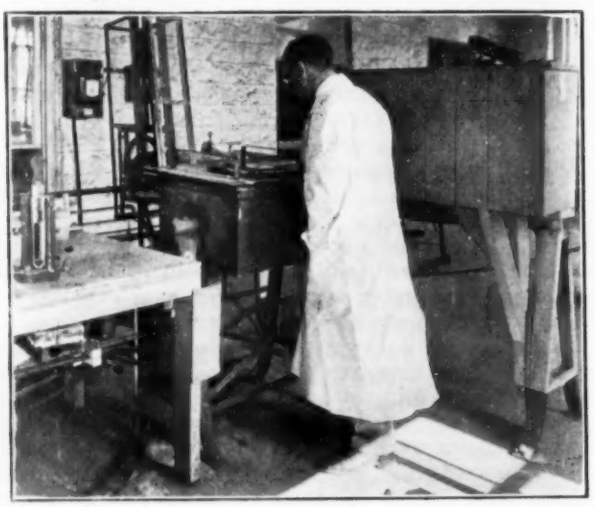


FIG. 8. EVACUATED HIGH FREQUENCY INDUCTION FURNACE IN MELTING POSITION

Some alloys solidify so quickly that they have to be poured with the greatest speed possible, even from the hottest furnaces. Other alloys not so high in fusing point, would produce sounder ingots, if allowed to cool from a superheated condition to a definite casting temperature.

As a possible source of better and less expensive fuel, drilling operations were carried out underneath the plant, with a result that large flow of natural gas, at a pressure of 450 lbs., was encountered at a depth of 1,050 feet. This furnished an almost unlimited supply of good clean fuel, possessing 1,100 B.t.u.'s in contrast to the 600 B.t.u.'s in the gas previously used. This led to other special melting and annealing equipment, all of which were subjected to accurate temperature control. Uniform annealing in constant temperature furnaces caused still further improvement in a number of the products. Previously it had been considered good practice to remove coldwork hardness by heating to redness with hand torches. This obviously led to a non-uniformity in heating, with a resulting increase in breakage of diamond dies, swaging dies and even complaints from consumers because of non-uniform finished products.

SEGREGATION AND BLOWHOLES

In spite of these various developments and improvements, complaints continued to be received both from the trade and from the consumers. These complaints were of great variety and number. Casting golds would not cast properly, wire was too soft or was too hard. Rolled clasp plate would break on bending, would melt when soldered to and so on. A number of these complaints were possibly not justified; a number, however, were. There was no assurance that blowholes or pipe structure in cast billets would completely close up upon swaging, drawing or rolling. Analysis of crucibles from the furnaces of the complex alloy department, showed too great a platinum content, proving that this metal under the very best of conditions then prevailing, was not completely going into solution. If the platinum did go entirely into solution, there was no assurance of its uniform distribution throughout the melt. In some instances, the time required for an apparently complete solution would result in a loss of other metal. Variation in finished products was clearly shown by chemical analysis also by physical tests. The principal instruments employed in the testing laboratory were the Brinnell, Rockwell and Sclerescope, also the Olsen, and specially constructed Scott dynamometer. For tests of extremely small cross sections, two instruments were constructed in the plant machine shop. For metallographic work, both Bausch and Lomb, and Spencer Lens equipment was used. For temperature determinations, both the Wilson-Mauelen Tapalogue and the Leeds-Northrup optical pyrometer gave very good results. Before testing, all billets were subjected to uniform heat-treatment in electric resistance furnaces. Test sections of wire were accurately drawn through diamond dies. A

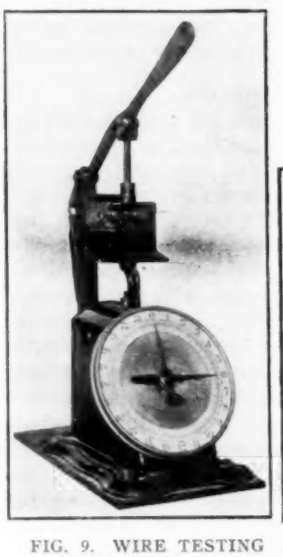


FIG. 9. WIRE TESTING INSTRUMENT

FIG. 10. ELASTICITY TESTING INSTRUMENT

number of experiments were conducted in a research foundry and laboratory where billets were cast from alloys melted in granular carbon high temperature resistance furnaces.[2] In this instance the billets were fairly sound but due to carbon contamination were quite brittle and unworkable. The alloys in this work, were greatly superheated under proper protective covering, and allowed to cool to the desired pouring temperatures. Considerable work was also carried out with special shaped molds. Mold temperatures were also carefully checked. Various deoxidizers were also used. In some instances deoxidizers resulted in sounder ingots but desirable physical characteristics were impaired. Centrifugal casting was also tried with wide variations of mold temperature, rate of pouring and speed of rotation.

EXPERIMENTS WITH THE HIGH FREQUENCY INDUCTION FURNACE

Photomicrographs of returned defective materials or of materials known to be defective from routine productions, such as "slivery" or "cuppy" wire, showed in many instances, decided segregation. There was the oft repeating occurrence of non-uniform alloying of the metals of the platinum group, and in some instances, nickel. After a careful consideration of additional equipment or processes which might be installed to give greater uniformity and reliability to these very specialized alloys, it was decided to purchase an Ajax-Northrup high frequency induction electric furnace. During the first few weeks of

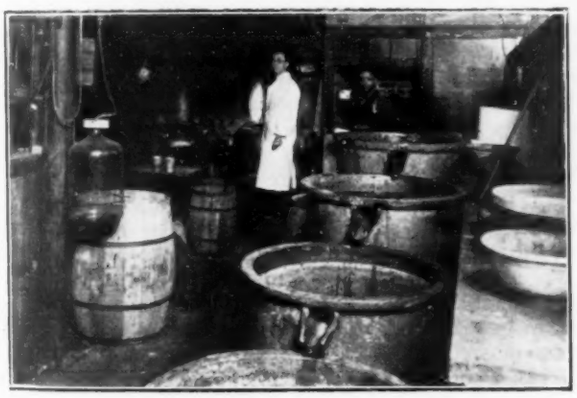


FIG. 11. PART OF SMELTING DEPARTMENT

installation, results with this equipment were not very encouraging. Lampblack was first used as a heat insulator. As a result gases were evolved which caused quite serious illness to a number of the men. On two occasions, there were fairly violent explosions. Due to leakage in the old type of discharge gap, which has since been discarded, mercury contamination was not only present in the air, but even made itself apparent on some of the finished gold products going through the plant. This, of course, meant complete scrapping. Extremely high temperatures were so easily obtainable and in such a small fraction of the time in contrast to that which the melters were previously accustomed, that alloys were melted and poured at greatly superheated temperatures. Some refractories previously used were now no longer suitable. Also of some consideration was the fact that there was a certain apprehension or mental effect on the part of the melters who had been using the flame type of furnace for years. There was apparently no source of heat or heat application, yet their most refractory alloys melted and even boiled in just a few moments time. Metal might be at a white heat yet the crucible containing the metal could be lifted from the inductor coil with the bare fingers. Strips of metal of very high fusing point could be held in the hand and melted within an inch or so of the fingers, showing the speed, of course, with which the heat was applied. Metallic platinum could be added to the usual gold silver and copper alloys in a crucible and due to its greater electrical resistivity, it would apparently melt equally as quickly as the other metals. The vigorous stirring action due to magnetic flux or eddy currents, when

FIG. 12. ELECTROLYTIC GOLD AND SILVER REFINERY

melting by direct induction, was noted immediately. This was a stirring accomplished with ease, such as try as they might, they could not accomplish by any previously known method.

The manufacturers of this equipment were whole hearted in their advice and assistance. They at once suggested means of overcoming a number of the difficulties. A new and very efficient type of discharge gap was installed. Electrically sintered magnesia replaced lampblack as a heat insulator and as a consequence, no gases were evolved. Various shapes and types of inductor coils were installed. Some were suitable for melting by direct induction, others for lining with a graphite sleeve. The question of sufficient temperature was completely solved. Homogeneous and thoroughly mixed alloys were absolutely certain and there was no brittleness or contamination of the cast billet. In some alloys, best results were accomplished by direct inductive melting. In other instances, better results were accomplished by melting in the interior of a covered graphite sleeve. When melting under these latter conditions, contrary to general opinion, there is still a decided stirring action in the metal. Certain alloys subject to extreme gassing or to abnormally large shrinkage, were found to improve greatly when cast under vacuum. Almost all of the alloys contain varying proportions of copper which, of course, must be carefully protected from oxidation. The highly reducing atmosphere easily obtained during inductive melting allows the use of a very minimum of flux and in a great many instances, none at all. A number of alloys may be manufactured in quantities which are absolutely impossible to melt in the flame type of furnace. The melters no longer felt apprehension or danger from shock, contact or effect of high frequency current. In fact it led to an added interest in things electrical which resulted in a wide number and variety of plant assembled radio receiving sets which easily surpassed in performance, the "store" set of the writer. It is also needless to say that the melters worked in greater comfort than they ever did previously, before a bank of gas furnaces.

There are other points of interest in connection with inductive melting which might well be taken into consideration. The loss of precious metal also the weekly crucible clean-up is reduced to a minimum. When melting by gas furnace, small buttons of precious metal cling tenaciously to the flux along the walls and bottom of

[2] F. A. J. Fitzgerald Laboratory, Niagara Falls, N. Y.

the crucible. With the little or no flux used, this loss is reduced at least 50 per cent. During the past year, the converter has only been out of commission for two hours and then merely for purpose of cleaning the mercury in the discharge gap. At the present time, the converter feeds a number of different types of furnaces, all of which are assembled in line on a transite covered bench. The individual furnaces may be put into operation or cut out by means of conveniently placed switches. In many instances two furnaces may be operated simultaneously from the one 35 kva. converter. Melts of high fusing alloys which would previously consume one day may now be run through in approximately one half hour, or merely the time necessary for mold preparation. Plant production has greatly increased with little or no increase in overhead.

The supply of natural gas obtained on the property is now used almost exclusively in the smelting and refining departments where the nature of the work makes the flame type of furnaces necessary. This, however, is again a decided saving and of considerable advantage in competitive bidding inasmuch as fuel cost is an important factor. For special operations, however, in the smelting department, high frequency current has been carried to points one hundred yards distant from the converter.

By inductive melting, the quality and uniformity of all products have been greatly improved. Products are manufactured from alloys previously impossible to melt. New uses for high frequency is being developed from time to time. Avenues of research are now opened which were hitherto almost insurmountably closed. The equipment is undoubtedly ideal for the industries engaged in the melting, smelting, refining and manufacturing of highly refractory alloys, or alloys of precious metals, where volumes are not large but values are great.

The results obtained industrially were so satisfactory that in co-operation with the Ajax Electrothermic Corporation and the General Electric Company, research is being carried out with a ¼ kw. tube converter, operating from a lighting circuit, with a view of perfecting an apparatus and method of casting, whereby a dentist may obtain results equal to those obtained industrially. At the present time, very substantial progress has been made.

Oxidized Brass

By W. J. Reardon

Q.—Please answer these questions in next issue:

1. What kind of a flame is the best in an oil burning furnace? We have an old fashioned furnace 5 ft. x 5 ft. with a tuyere on either side and oil burner in the end, and when flame comes out of the tuyere it is sometimes yellow and sometimes white and other times green. Which is best?

2. We make a metal of 50% copper and 50% lead and when the castings are machined they show dirt. When the metal is tapped into the crucible there is a lot of dirt on top. Now the thing that I want to know is what can I put on top of metal to form a slag to hold the dirt together so I can keep it from going to mold?

A.—1. The kind of a flame that is most desirable in melting in an open flame oil burning furnace, is one that will burn all the oil; in other words perfect combustion. The color of the flame changes with the condition of the metal. The neutral flame, when the metal is charged in the furnace, will be white. As the metal melts is will turn green in the center. If you have the proper oil pressure and a positive air pressure you can maintain perfect combustion. We do not think you can judge the operation of the furnace altogether satisfactorily by the flame.

2. As you say when the metal is poured from the furnace there is a lot of dirt on top. If you charge clean metal and dirt is produced from the metal, your dirt is oxidized lead. This which you will find also in the casting is not dirt, but oxidized metal. A good flux to reduce this oxide in an open flame furnace is ground coke dust. This can be had from any foundry supply house. It must be ground as fine as flour. Also to prevent this oxide from entering the mold in 50% copper and 50% lead alloy, use flat knife gates into the casting. This will help you overcome some of your difficulty.

Oxidized High Lead Mixture

By W. J. Reardon

Q.—We are sending you a sample of red brass, which you will notice is pitted very badly on the machined surface. This condition was noticeable about a month ago and grows steadily worse; not only on this casting, but all our red brass work. The metal and the sand are the is an important factor. For special operations, howsame that we have used for years. The metal analysis is Cu, 80.5%; Zn, 11.5%; Pb, 5.5%; Sn, 2.5%; melted in open flame, and oil pit furnaces. We use 1½ ounces of phosphor copper to every hundred pounds of metal, thoroughly stirred into the metal just before pouring. If you can give us any information we will appreciate it.

A.—On examination of sample of red brass casting we find that the metal is very badly oxidized, and we are of the opinion the furnace is not operating properly. We would suggest an examination of the furnace to see that it is kept clean and free from slag and not built up on the bottom with slag. Use fluorspar to keep it clean. Second, see that you have 16 ounces of air pressure and 30 to 40 pounds oil pressure, and run what we call a perfect combustion; that is, a flame where all the oil is burned by the air. If the melting is too prolonged the flame is playing on the solid heated metal. Most of the oxidizing and sulphurizing of a heat is done before the metal melts and this is one reason castings are found porous.

If the oil you are using is high in sulphur, it is important to get the metal under cover as quickly as possible. Texas oil generally runs .150 to .170 sulphur and 19000 B.T.U.; Pennsylvania oil, 0.06 sulphur and 20,000, B.T.U. Ohio oil, 0.60 sulphur and 20,000 B.T.U. We think you should have your oil at least under 1% sulphur for open flame furnace work.

So, assuming that the metal you are using is O.K., your trouble is in your melting, either in the handling of oil or air pressure or the grade of oil you are using, and we suggest you check these items.

Brass for Saxophones

By W. J. Pettis

Q.—I am considering the manufacture of saxophones. What is the best metal to use?

A.—The quality of brass used in the manufacture of wind instruments, cornets, horns, etc., is governed largely by the factors of tone, artistic appearance, and the ductile qualities necessary to stand forming into the various shapes without injury to the metal used. Copper, zinc, and tin alloys are used. An alloy of 67 copper, and 33 zinc, is largely used in making band instruments. This readily takes nickel, silver, or gold plating. Just what alloy is best adapted to any special instrument could only be answered by a specialist in this line of work. Most of the brass mills advertising in the Metal Industry, maintain a technical department and gladly advise on any manufacturing problem involving the use of special brass or bronze.

Core Baking With Electric Heat

A Description of Core Making Covering Sands, Binders and Electric Baking. Serial Report of the Power Committee, National Electric Light Association.

Concluded from our March Issue.

ELECTRIC CORE BAKING

Experiments were conducted to determine the proper baking temperature and to secure data on ventilation. The cores tested were of the composition shown in Table I.

TABLE I. CORE MIXTURE

Mixture No.	Application	Materials	Weight	% Total Weight
1	Molding Machine work	Silica sand	216	63.95
		Loam sand	72	21.35
		Sand blast dust	40	11.88
		Oil	6	1.78
		Dextrine	3.5	1.05
2	Heavy bench work	Silica sand	73	16.03
		Sand blast sand	88	19.60
		Old core sand ..	288	64.14
		Dextrine	1	0.23
3	Splicer covers only	Silica sand	288	97.3
		Oil	6	2.03
		Dextrine	2	0.67

The results of the experiments are given in Table II.

TABLE II. COMPARATIVE TESTS IN ELECTRICALLY HEATED OVENS

Run No.	Temp. Deg. Fahr. Initial	Final	Time Hrs.	Crushing Load, Lb.	Tensile Strength, Lb.	% Moisture in Core Sand	Baked Cores
			No. 3 Core Mixture				
1	300	400	1½	1,712	192	5.44	0.13
2	300	450	1½	1,739	187	5.44	0.13
3	300	500	1½	1,244	166	5.44	0.12
4	450	450	¾	1,965	121	5.44	0.16
5	500	500	1	1,516	143	5.44	0.11
			No. 4 Core Mixture				
6	450	450	1¼	1,550	142	6.38	0.14
7	300	300	1½	675	66	6.47	0.13
8	350	350	2	802	95	6.47	0.16
9	400	400	1	906	88	6.47	0.14
10	400	400	1½	1,206	105	6.47	0.16
			No. 7 Core Mixture				
11	400	400	1½	2,209	194		
12	400	400	2	3,854	342		
13	350	350	1	754	66	6.13	
14	350	350	1½	1,313	118	6.13	
15	350	350	2	2,690	180	6.13	

The conclusions drawn from the experiments were the following:

1. In baking small cores it is not necessary to heat the cores at a low temperature at the start in order to allow moisture to escape before the oil hardens.
2. Due to the dextrine in these cores, 450 deg. fahr. was found to be too high a temperature, as the dextrine evidently burned, resulting in weak cores. A baking temperature of 400 deg. fahr. was found to give the best results.
3. Electrically baked cores had a strength of 50 to 200 per cent greater than cores baked in the gas or oil oven.
4. The time of baking on cores containing dextrine was 1½ to 2 hours at 400 deg. fahr., but on other cores it was said to be 1 hr. at 450 deg. fahr.
5. Many ventilation tests were made resulting in the statement that ventilation is of secondary consideration, provided fumes are sufficiently removed to prevent their being obnoxious to workmen.
6. Twelve pounds of green cores were baked per kilowatt-hour.

(a) The object of core baking is to evaporate the moisture and drive off the volatile constituents of the binding material, leaving the sand bound together in a strong but porous mass by the solids of the binder.

(b) Advantages of electric core baking are—automatic temperature control; even distribution of heat; no danger of explosions; no over-heated cores; reduction in baking time; greater thermal efficiency; reduction in percentage of breakage and rejections; electrically baked cores have 50 to 200 per cent greater strength; and more even baking of large cores due to the penetrating effect of radiant electric heat.

(c) Experiments show that cores not containing a corn product binder are best when baked at a temperature of 450 deg. fahr. for one hour.

(d) Cores containing corn products should be baked at 400 deg. fahr. for 1½ to 2 hrs.; to prevent burning of the corn product binder, this temperature should not be exceeded.

(e) Tests indicate that ventilation of the electric core baking oven is of secondary consideration, providing there is sufficient ventilation to remove obnoxious fumes.

(f) Kiln type core baking ovens bake 11 to 14 lbs. of green cores per kilowatt-hour; the smaller the cores, the greater the output.

ADVANTAGES OF ELECTRICALLY HEATED CORE OVENS

From a study of the results obtained from an electrically heated core oven, the following advantages were found to be very marked. The cost of electricity was found to be more than the cost of oil or gas. The cost of power, however, is becoming less and less a matter of importance when comparing electric heat with other forms of heat. The many advantages obtained by electric heat when correctly applied are such that the cost of power is a small item.

The main advantages of electric heat for core baking ovens are:

1. Improved working conditions due to the absence of fumes and heat from the oven.
2. The negligible amount of labor required to operate

the oven, as the temperature is controlled automatically. No labor is required, except for loading and unloading the oven.

3. The definite and exact control which can be obtained of the strength and other physical qualities of the cores. This insures that the resulting casting will be of good quality.
4. The freedom from loss due to spoiled cores.
5. The increased production which may be obtained in electrically heated core baking ovens.
6. Another advantage which should be emphasized is the fact that the cheapest possible core mixture or binder may be used to obtain the desired strength of core on account of the absolute control of temperature and time of baking which may be obtained. As an illustration, we found that cores baked in electrically heated ovens were from 50 to 150 per cent stronger than those baked in oil or gas heated ovens. It is evident if these gas heated oven cores were strong enough, that by cutting down the amount of oil or other binding material in the mixture and baking in electrically heated ovens, the same strength of core could be obtained and that the saving in the binding mixture would much more than make up for any added cost of electric heat.

Installation	Total Metal	Weight of Sand Lb.	% of Load	Total Lb.	Lb. Sand per Kw-hr.
No. 1	4,045	2,529	38.2	6,624	12.65
	3,830	3,071	44.5	6,901	13.3
No. 2	4,110	3,073	42.8	7,183	15.6
No. 3	2,000	4,000	66.5	6,000	12.1
No. 4	1,400	750	34.9	2,150	6.8
No. 5		8,000 Mould First Bake		9.09	
		1,500 Drying		10.00	
	746	1,920	72	2,666	20.9

DATA ON INDUSTRIAL HEATING INSTALLATIONS

Installation A

Product	Motor trucks,
Work Done	Core baking.
Equipment	One core oven
Size	81 in. x 81 in. x 104 in.
Insulation	4 in. magnesia walls.
Ventilation	Stack
Electrical Equipment	72 kw. oven heaters placed on sides of oven
Pyrometer	Automatically controlled.
Temperature	325° F. to 450° F.
Time	Average times current is on 2½ hours. Current is on until oven reaches maximum temperature, after which current is off until temperature falls to 325°, when the oven is again brought to maximum temperature. Then the work is allowed to soak for 3 hours.
Load	Average load 750 pounds of cores on core rack mounted on truck.
Pounds per Kw-hr	4.17.
Previous Heating Process	Gas and coke.
Cost of Operating Compared with Previous Heating Method	No figures available, but considerably lower.
Reason Why Installed	Lower cost and much better results.
Opinion of Installation from User's Standpoint	Very satisfactory.
Opinion of Installation from Central Station Standpoint	Very desirable.

Installation B

Product	Gears and machines.
Work Done	Core baking.
Equipment	Two ovens.
Size	1—11 ft. wide, 18 ft. long, 8 ft. 3 in. high. 1—6 ft. 6 in. wide, 6 ft. long, 7 ft. 3 in. high.
Insulation	4 in. of nonpareil in sheet metal.
Ventilation	Forced circulation. No recirculation.
Electrical Equipment	1—160 kw. in oven located on walls and floor. 1—45 kw. oven heated located on walls only.
Pyrometer	Automatically controlled.
Temperature	450-500° F.
Time	Large oven 8 P. M.-5 A. M., 1200 kw. hrs. per day. Small oven used for day baking—300 kw. hrs. per day.
Load	Large oven 5 tons of cores. Small oven 1500 lb. per bake.
Pounds per Kw-hr	Large oven 12½ lb. Small oven 15 lb.
Previous Heating Process	Coke ovens.
Cost of Operating Compared with Previous Heating Method	Double previous cost.
Reason Why Installed	Better grade of cores.
Opinion of Installation from User's Standpoint	Satisfied with results and cost.
Opinion of Installation from Central Station Standpoint	Night load of large oven highly desirable. Unity power factor.

Refining Zinc

By EDMUND R. THEWS

Q.—I have read with much interest the article in the February 1927 number of THE METAL INDUSTRY on "The Production and Refining of Remelted Zinc." We are doing some remelting of high grade, clean zinc and our chief problem is the prevention of contamination of the zinc by the iron pot. At the present time we are using the ordinary cast iron pot such as is used for feed cookers by farmers. We have tried various kinds of steels and one or two types of cast iron pots but have always come back to the feed cooker as the best suited.

We note on page 61 that you give an analysis of a cast iron which you state is resistant to the action of the zinc and the hot gases. Can you inform us where we may obtain a melting pot having this analysis? We should like very much to obtain a cast iron which will dissolve less rapidly than that used in our present pots.

You also state that a steel containing a few per cent of manganese and chromium will also successfully withstand the action of the zinc.

On page 62, under 4, you state that you refine the zinc by sulphurizing and steaming it. We have not used this method and we should like to have you advise us the exact function of this operation and if possible, give us the details of how it is carried out. Do you know whether any sulphur is retained by the zinc in this treatment?

A.—The chief problem encountered in remelting and refining zinc correctly is not the contamination of the zinc by the iron dissolved—since this may largely be removed by the sulphurizing treatment—but the everlasting trouble connected with the rapid corrosion and destruction of the melting pots.

While it is impossible, of course, to entirely eliminate the corrosive action of the zinc, much can be done in the way of employing suitable melting pot material and efficient conduction of the process to lengthen the life of the pots. Considering everything, the following points are to be observed:

1. Steel pots containing a few per cent of manganese or (and) chromium should be used in preference to iron.

2. The deeper the pots in proportion to their upper diameter, the purer the zinc produced.

3. The castings should not be finish treated by polishing or sand blasting, since the skin is much more resistant to corrosion than the steel or iron below.

4. The fuel used ought to burn as soft as possible, lignite giving the best results. Artificial draft and other heat raising measures must be avoided under all circumstances.

5. The inside of the pots should be washed with inert substances as frequently as possible, the best washing material in the experience of the author being a mixture of about equal parts of slaked lime and graphite made up to a syrupy paste.

6. The zinc must not be overheated, a temperature of 875-885° F being sufficient for both pots of the system.

7. In sulphurizing the zinc, the sulphurizing box should not be allowed to touch the bottom and side walls of the pots but should be fixed to the steel rod sufficiently high to prevent the sulphur vapors produced from being forced down to the bottom.

The sulphurizing process has been described in the article on this subject. It is clear that by the action of the hot sulphur vapors, most of the iron and a considerable part of the copper and other impurities are sulphurized and brought to the surface of the metallic bath. The action of the water vapors is to assist in the sulphurizing action and to oxidize those impurities which are not readily sulphurized directly under prevailing conditions.

Any iron box of a diameter of 5-8 in. and a height of 7-12 in. may be used for this purpose. The lid of the box is perforated by a few holes (¼ in. in diameter) and the box welded to a steel rod 1 in. thick about 5-7 in. above its lower end. In sulphurizing, the lid must be directed downward, of course. The rod should not be taken too short, if only to increase its weight which is to counteract the lifting effect and back pressure of the hollow and practically empty box within the metal.

All Metal Airplane

The Bureau of Aeronautics is now at work on plans which will transform planes of the PN-10 patrol type into planes with metal wings. At the present time most of the planes of this type are without metal wings.

The metal used is largely Duralumin, consisting of copper, 4%; magnesium, 5%; manganese, .75%; aluminum, balance.—GILLIAMS SERVICE.

ALL METAL AIRPLANE

Large Bronze Casting

Below is an illustration of a bronze impeller casting made by the Cramp brass foundry, Philadelphia, Pa., for the Worthington Pump & Machinery Corporation. The casting weighed 10,540 lbs.

LARGE IMPELLER CASTING

The Fundamentals of Brass Foundry Practice

A Description of the Basic Laws Which Control the Melting and Casting of Metals and Their Application to Practical Foundry Operations*—Part 10

Written for The Metal Industry by R. R. CLARKE, Foundry Superintendent

In further connection with inclining molds in pouring, the question of pressure in different parts of the mold might be considered On the level with or against gravity, sprue pressure at gate attachment is practically the same in all cases. In level pouring sprue pressure is uniform throughout the mold. With gravity this pressure increases with distance from the gate and reaches its maximum at the opposite end. Against gravity the reverse is the case. A mold inclined and poured with gravity will therfore "cope" and strain readily and should be more securely protected against this possibility. All in all, the practice of inclining molds with gravity involves many conditions to which physical law does not subscribe.

In double pouring and in multiple gating thin castings the laws of motion should always be reckoned with in order to enlist their aid to best results. Fig. 39 offers

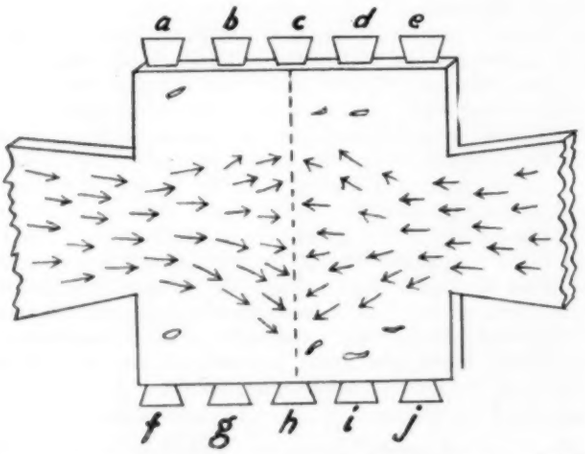


FIG. 39. VIOLENT CURRENTS OF METAL FROM OPPOSITE DIRECTIONS MEETING IN THE MOLD

a valuable study. Double gated and poured from points directly opposite, two streams of metal approach each other violently meeting at or near the centre line of the mold. The result is a hard smack at the meeting point, a sudden stop and a turbulent recoil by which particles of molten metal are thrown to isolation in different parts of the mold there to await, in rapidly congealing condition, the following metal none the less wild and erratic in its motions. Practically every law of motion, force impressed, direction, change of direction, action and reaction, etc. assert their authority, and the thing that happens is the thing that does the least good to the casting. Multiple gates directly opposite each other produce a similar condition, though to a degree not so pronounced due to the reduced momentum of the smaller volume of colliding streams of metal. Further study continues in Fig. 40 when the gates on opposite sides of the plate are placed out of line with each other. Here the situation is by far the more logical. The streams of metal cross the mold to the opposite side losing some of their momentum and lessening their impact and damage done.

The effect of delivering the metal to the mold at different angles offers a further study of signal importance to the different classes of work. Fundamentally, the retarding influence of change of direction on the velocity of current is confined chiefly to the loss in momentum the current has picked up in transit along a straight channel to the point of change. For instance, metal dropping down a perpendicular sprue loses all its momentum at the bottom of the sprue and awaits a rise of metal in the sprue to furnish the impelling force to drive it onward through the runner gates. Naturally, the higher this rise the more powerful the drive and the greater the velocity of gate

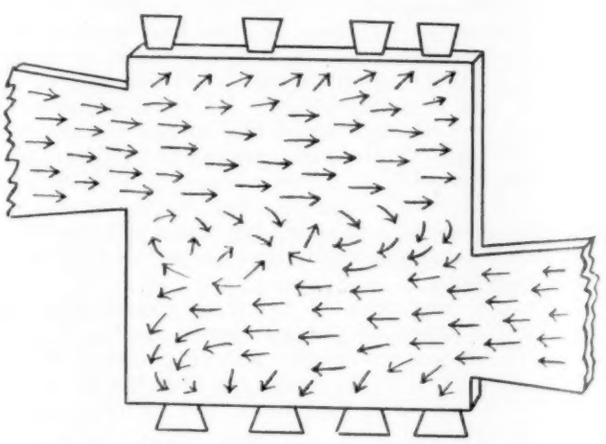


FIG. 40. GATES OUT OF LINE WITH EACH OTHER

current. In pouring light castings, the practice of suddenly tipping the ladle to fill the sprue at once is nothing more than effort to get maximum drive and velocity from the very beginning of pouring.

Gravity acts perpendicularly downward and the perpendicular is the shortest distance between a line and any point outside that line. Taken together, these two principles form a very practical consideration in the mounting of pattern plates or in the placing of loose or gated patterns with respect to the distance of the gate end of the runner gate from the edge of the flask and the determining influence this distance may exercise on the perpendicular position of the sprue to the horizontal direction of the runner gate. To escape the effect of height in falling metal, the ladle or crucible lip should be as close down to the sprue as practicable. In pouring molds from the sides or edges this height necessarily increases with distance from the sprue to the edge of the flask. Figures 41 and 42 furnish the study. In sprue C (Fig. 41) runner gate end "A" throws the pouring funnel of perpendicular sprue CA in proper position for good pouring. But runner gate end B (Fig. 41) is so far from the edge of the flask as to throw the pouring funnel of the perpendicular sprue DB so far in as to necessitate a high pouring position of the ladle or crucible. Now it is not a good thing to place the runner gate too close to the edge of the flask because of the greater liability of a run-out. But it is no less

*All rights reserved. This series will be collected and published in book form. Parts, 1, 2, 3, 4, 5, 6, 7, 8 and 9 were published in our issues of July, August, September, October, November, 1926, January, February, March and April, 1927.

an evil to get it so far away as unreasonably to increase the height of the ladle in pouring the mold, because the increase in height only adds to the velocity and impact

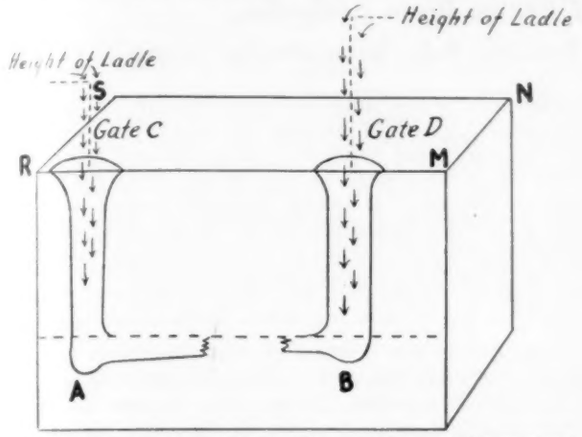


FIG. 41. EFFECT OF LOCATION OF GATE UPON HEIGHT OF LADLE.

of the metal in striking the bottom of the sprue. To get closer to the flask edge with the pouring funnel the slanting sprue SP (Fig. 42) is commonly resorted to. The practice is not of the best since the dropping metal strikes the walls of the sprue, deflecting over and across, cutting away sand, running longer distance and reaching the runner gate in less satisfactory condition. In placing patterns on plates, maches or in molds, the better plan is to so position them as to throw the sprue end of the runner where its perpendicular to the top of the mold falls reasonably close to the flask edge.

Up to a certain point, it seems to be an attribute of liquid

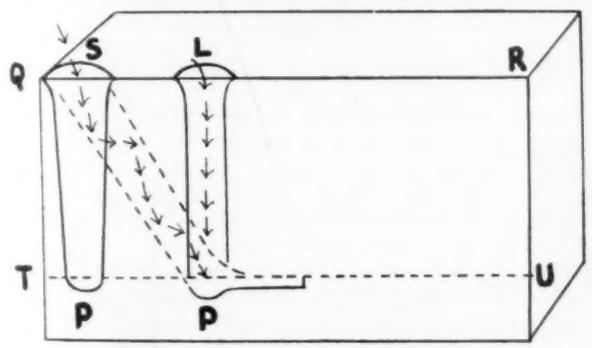


FIG. 42. THE SLANTING SPRUE

metal to purge its stream of dirt and dross after a distance of running. At any rate experience shows that a clean casting from a short gate between the casting and the pouring sprue is a hard matter to realize.. Difference in specific gravity between the liquid metal and the solid impurities in it along with the principles of flowing metal are primarily responsible. The impurities being lighter, work to the gate side walls and are there held. The longer the distance of flow the greater the chances of arresting dross. Whatever the explanation, it is undoubtedly a fact that up to a practical limit a casting will run cleaner from a long than from a short gate between the casting and the pouring sprue.

In line with the laws of gravity, falling bodies and the two first laws of motion, the following are practical and valuable facts applying to liquid metal in transit through its gates.

All things else being equal:

1. Velocity of current varies with fluidity of metal and is independent of the kind or weight of metal. Through the same gates a mold can be filled with aluminum just as rapidly as with iron.

2. Momentum of current varies with velocity, specific gravity and mass.

3. Both velocity and momentum vary with the force impressed which reverts to the vertical height of metal in the pouring sprue.

4. The height of the ladle above the pouring sprue increases the initial velocity of the metal stream entering the sprue and adds to the velocity, impact and momentum of the metal at the bottoms of the sprue, but in no way affects the static pressure of the sprue at the conclusion of pouring. Metal poured from height above the sprue gets a harder "shot" no doubt, but is, if anything, at a disadvantage compared to metal poured with the ladle close down to the sprue.

5. Velocity varies with the freedom of motion as affected by the size of volume of runners, with change of direction of current and with ratios between volumes of sprues to runners. In change of direction velocity varies with the angle of deflection and with the abruptness of change as between straight or curved channels of transit. Due to friction and congelation, further factors of velocity are the relative surfaces of gates and the ratios of their volumes to their surfaces.

6. Falling metal attains its maximum velocity at the bottom of the perpendicular sprue and by impact bounds onward into the runners, but this bound or leap of metal would not carry far if not immediately backed up by the pressure of the metal in the sprue.

7. In a deep mold gated at the top, the metal stream falls to the bottom of the mold along the line of the parabola curve and any delicate mold parts should either be kept out of line with the curve or protected against the falling metal following it.

8. A stream of metal finding freedom in a mold from a horizontal runner gate proceeds by its momentum until finally stopped by friction and atmospheric resistance. This momentum is often sufficient to carry the stream violently forward to points beyond what might be supposed.

9. Metal entering a mold at the top from a horizontal runner follows the parabola and in striking the bottom of the mold splashes mainly forward in line with its runner gate motion. If the point of impact be close to or against the walls of the mold the force of the splashing metal may be sufficient to attack the sand wall.

10. In a deep mold gated and poured from the bottom, the rate of flow is proportioned to the perpendicular height of the pouring sprue top above the level of the metal in the mold. All bottom poured molds pour more slowly as the mold gradually fills.

Many practical applications of these truths constantly arise in molding. Suppose we have a thin flat plate to run and resort to a proper delivery gate say ⅛ inch deep by 3 inches broad. Now a 1-inch diameter sprue will supply all the metal this delivery gate can carry and can be filled to its full height and maximum pressure quickly. Suppose the molder uses a 1½ inch instead of 1 inch diameter sprue which cannot be so quickly filled, he only wastes metal in the sprue to the disadvantage of the casting. Suppose again he cuts a delivery gate greater than the needed volume. The metal only tarries in filling this gate, checking the rise in the sprue, losing its fluidity and reducing capacity to run the casting. Again suppose we have a casting where a thin section joins a heavy section. We gate and pour on the heavy section and the metal tarrying to fill it misruns the light section. Far better to gate and pour on the light section and take care of shrinkage in the heavy section by other means.

This series will be continued in an early issue.—Ed.

Plating Racks

The Importance of This Part of Plating Room Equipment

Written for The Metal Industry by WILLIAM E. BELKE, President, Belke Manufacturing Company, Chicago, Ill.

Acids, tanks, anodes, machines, pungent odors and bubbling liquids—these and a thousand other details identify the plating plant, where dainty jewelry, destined for the dime store or Fifth avenue jewelry shop, and bumpers and guards, en route to the automobile factory, receive their coat of metal before going out into the world. The plating plant, minor among industries, but prominent in importance, is a place of a thousand details, and represents thousands of dollars investment.

The position occupied by plating racks, however, is of foremost importance, for it may be said that racks "uphold the industry." They support nine-tenths of the products plated, and inefficiency in racking means a leak in profits that cannot be ignored.

There are so many angles to the apparently simple process of racking, that failure in one of its complications may mean the undoing of days of valuable effort direct toward producing a job. It will be the object of this series of articles to point out the more frequent mistakes made in racking, and to illustrate little secrets that will prove to be of great value.

MODERN PLANT—ANCIENT RACK

It is a jar to one's peace of mind to go through a plating plant, where many thousands of dollars have been invested in machinery, and every detail is modern, and to see ancient, wasteful methods used in racking. Shadows of a crude yesterday darken the plant where racking is reduced to taking a bar of metal from the waste pile, tying a few strings of dirty wire in various places, and suspending the whole in a tank with the expectation that the products hanging on the rack will emerge perfectly plated. It is not possible.

In constructing a rack, the first thing to be considered is the spine, which must be heavy enough to carry great amperage, and rigid enough to support a good load. Choice brass must be chosen, manufactured for the purpose. Its surface must be smooth and clean, and the rod must be straight. It should not have too much surface, or it will attract much metal from the anode which should go to the article being plated. It should not be too thin, or it will not carry the proper current.

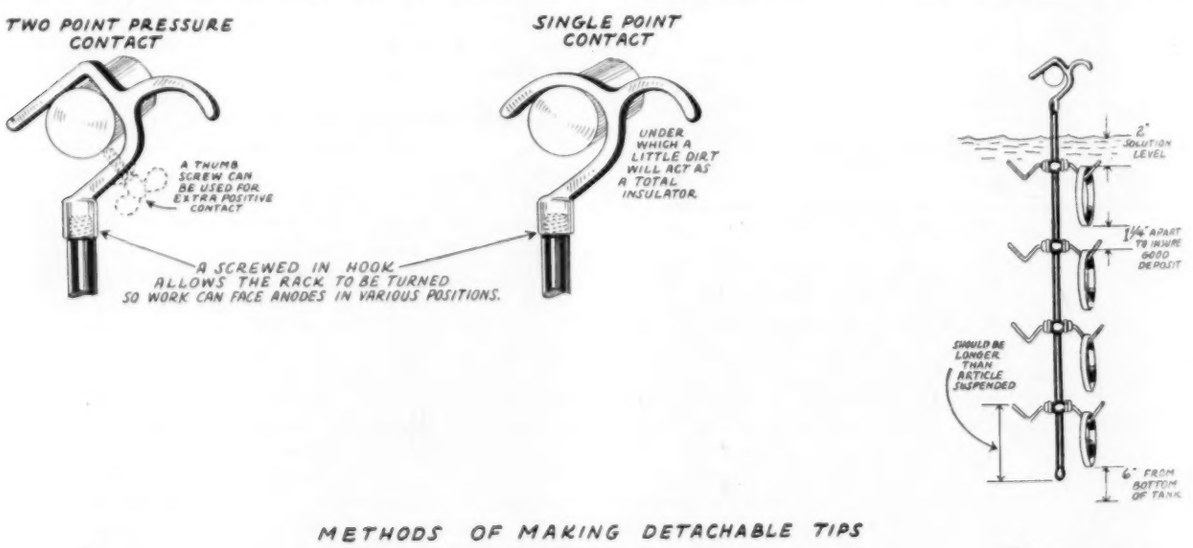
THE CATHODE HOOK

First comes the contact of the current-carrying rod which runs over the tank. For this purpose a cathode hook must be attached to the top. Because the cathode bar is round, it is the practice to make the cathode hook round. This is a fallacy. Always make the cathode hook in "V" shape (Illustration No. 1). The round cathode hook is never of the exact inside circumference of the cathode bar. Therefore, instead of securing a contact all around the inside circumference of the hook, there is only one contact, which comes where the hook rests upon the bar. (Illustration No. 2). Dirt can break this connection, and electricity, instead of flowing freely, will be halted, or may only seep through. By making the cathode hook in "V" shape, there will be two contacts, one on each side of the "V."

Since proper contact is so important, it may be found that even this double contact is not sufficient. A thumb screw through the hook, binding it tightly to the cathode bar (Illustration No. 1) will always prove effective.

ALWAYS SCREW HOOK

It is not wise to form the cathode hook by merely bending the top part of the rack. Rather make the hook a separate part, and screw it on the rack. This will en-


TWO POINT PRESSURE CONTACT
A THUMB SCREW CAN BE USED FOR EXTRA POSITIVE CONTACT
SINGLE POINT CONTACT
UNDER WHICH A LITTLE DIRT WILL ACT AS A TOTAL INSULATOR
A SCREWED IN HOOK ALLOWS THE RACK TO BE TURNED SO WORK CAN FACE ANODES IN VARIOUS POSITIONS.
2" SOLUTION LEVEL
1¼" APART TO INSURE GOOD DEPOSIT
SHOULD BE LONGER THAN ARTICLE SUSPENDED
6" FROM BOTTOM OF TANK
METHODS OF MAKING DETACHABLE TIPS
WIRE SCREWS IN NUT. IF WIRE SHOULD BREAK OFF, NUT CAN BE REMOVED AND NEW TIP INSERTED.
PUNCH PRESSED TIPS
ADAPTABLE FOR CHANGING PLATING COVER NUT AND SPRING BRASS TIP IS FIXED STUD IS IN RACK SPINE

DETAILS OF PLATING RACK CONSTRUCTION

able you to turn the rack on occasion, so that a side position will afford the best plating for the product. For instance, you have a plating rack, with contact tips extending through the frame, so that, when the rack is placed on the cathode bar, any products placed on the hook will be set in the tank parallel to the anode. This will be satisfactory for those products which are formed to face the anode bar, but if you desire to use another product on this same rack, which will not face the anode bar but will be at right angles to it, and this right angle position will be found improper, if the cathode hook is screwed on the frame, the frame can be turned so that the articles are in the right position. Also, there may be occasion where a product is racked, and one end comes too near the anode. It may be swerved by merely turning the cathode hook.

TIPS

The tip, of course, is the reason for the rack's existence. The proper shapes and sizes for tips lead us into such ramifications, when all of the thousands of articles plated are considered, that the subject is unlimited.

However, considering now merely the fundamentals, it may be said that the most important factor in creating the tip is to have it detachable. The tip is usually much finer in size than the rack spine, and will be coated with metal much more quickly. Tips will also break off, and to have tips soldered on to the spine will mean a great waste. If there are few tips on the spine, breaking of one or two will cause the entire rack to be thrown away. If there are many tips, breaking of a few, while not necessitating scrapping of the rack, will reduce the rack's capacity, and reduce the value of each immersion.

Tips should never be placed so high on the rack that it will hold the product too near to the surface. The top part of the uppermost article racked should never be closer than two inches to the surface of the solution. Articles should always be at least one and one-quarter inches apart to insure even deposit, as a general rule.

HOLD ARTICLE IN CENTER OF TANK

Articles plated should always be as much in the middle of the tank as possible, considering the anodes. It has been shown that no article should ever be closer to the surface of the solution than two inches, and it should also be understood that the bottom part of the lowest article must never be less than six inches from the bottom of the tank. It should be more, when the anode bar is so eaten that it does not extend far into the tank.

It will frequently be found that the employee will remove several racks, and rest them on the floor, against a box. If the bottom part of the article touches the floor, this part will leave a mark on the article. To avoid this, make the rack long enough so that the lowest tip will hold the product being plated high enough to avoid its touching the floor when set down.

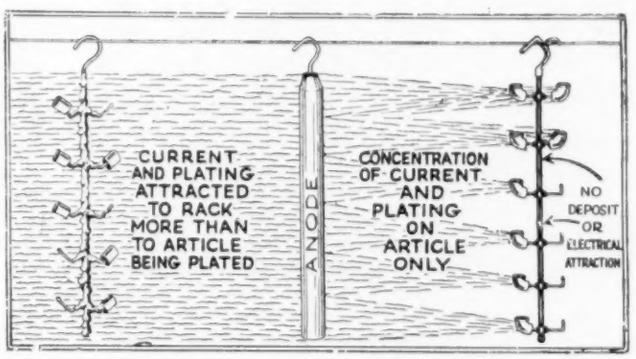
The plating capacity of tanks, in which the rack remains stationary, is very great, and, if the product is small, may be racked in quantities from one to several hundred per rack. Of course, the greater the number of articles, the more current they require, and greater thickness in the rack spine. However, this indicates that many articles may be plated in stationary tank, whereas the opposite is true of conveyor or automatic plating machine. On conveyor work articles should not be racked too deep as would be the case if both sides of a compound rack were used. Only one side is recommended so one side of the articles faces one row of anodes while the opposite side faces the next row of anodes. As the "throwing power" of these machines is not very great, it should be understood that best results can be obtained only when a few articles are placed on each rack, and these articles carefully arranged so that the plating surface exactly faces the anode bars.

VALUE OF INSULATED RACKS

A comparatively recent development in racking is the patented practice of insulating the spines. Racks nowadays are comparatively expensive affairs, and their use may be more expensive, for the spine, when bare, will attract metal from the anode, just as well as the product being plated. This is all waste, for the anode metal cannot be used when it lodges on the spine surface. A rack will be used for two or three different kinds of metal, for instance, and stripping off the metal from the spine will not be feasible.

Take, for instance, a brand new rack, placed in the tank for the first time. It will, when taken out, have received a coat of metal of equal thickness to that received by the article which it suspended. Also, its surface has been increased by that coat of metal, and the next time it is suspended it will receive another coat, this time receiving more metal, due to its increased surface. A rack is frequently used hundreds of times a week, and after a short time the surface is so great that it receives more metal than the products suspended.

To avoid this, the modern rack is covered with an insulating material, usually hard rubber. If properly


CURRENT AND PLATING ATTRACTED TO RACK MORE THAN TO ARTICLE BEING PLATED
INSULATION
CONCENTRATION OF CURRENT AND PLATING ON ARTICLE ONLY
NO DEPOSIT OR ELECTRICAL ATTRACTION

INSULATED VS. NON-INSULATED RACKS

attached to the spine, it will not permit metal to lodge on it. Thus, the anode bar will last longer, and the rack itself will have indefinite life.

SUMMARY

To summarize the principles of proper racking, it has been shown: 1.—That the rack must be heavy enough to carry sufficient current; 2.—It should have a screwed cathode hook; 3.—The cathode hook must make good contact; 4.—The tips should be spaced properly, and should be detachable; 5.—The spine should be insulated.

Lubricant for Tapping

By P. W. Blair

Q.—We are having considerable trouble in tapping brass castings with a high copper content. We have no trouble in boring but when the tap enters one-third of the depth to be threaded or tapped it stalls the machine.

A.—Use kerosene as a lubricant and it will drive the tap through the hole with ease and without the necessity of backing the tap during the operation. See that the tap is correctly relieved and has not too heavy bearing on the threads. By using the kerosene the threads should have a clean and burnished appearance.

Hydrogen Ions in Plating Solutions

An Explanation of the pH Method of Testing and Controlling the Acidity of Electro-Plating Solutions. A Paper Read Before the Bridgeport Branch of the American Electro-Platers' Society

By A. KENNETH GRAHAM
Chemist, Hanson & Van Winkle Company, Newark, N. J.

Author's Note: While it is recognized that papers read before the Society should be first published in the Monthly Review, the writer has been informed that owing to the amount of material available, this paper would not appear in the Review before the September issue. Because of the current interest in hydrogen ions and pH determinations, however, the paper is being released for immediate publication.

If equal volumes of dry hydrogen and chlorine gas are mixed and permitted to react under the influence of sunlight or an electric spark, colorless, dry, hyrochloric acid gas is formed. This may best be shown by an equation (1)

(1)	Hydrogen Gas		Chlorine Gas		Hydrochlorine Acid Gas
	H	+	Cl	→	HCl
Parts by weight	1		35.5	=	36.5
therefore	1 gram		35.5 grams	=	36.5 grams

The hydrochloric acid gas has no effect on dry litmus paper but if the paper is moistened with water it immediately turns red. Since acids turn litmus red this indicates that hydrochloric acid gas with water has acid properties. What part has the water played in this reaction?

According to our theory of electrolytic dissociation, acids, bases and salts when dissolved in water are dissociated (broken up) by the latter into ions (small moving particles) possessing positive and negative electrical charges. By equation (2) therefore, we see that hydrochloric acid gas dissolved in water has been broken up into positively charged hydrogen ions and negatively charged chlorine ions and the acid properties are due to the hydrogen ions.

One liter of solution containing 36.5 grams of hydrochloric acid.

(2)	Hydrochloric Acid (Undissociated)		Hydrogen (ion)		Chlorine (ion)	Acid Properties
	HCl	→	H^+	+	Cl^-	
a	36.5 grams	0%	——		——	None
b	18.25 "	50%	0.5 grams		17.75 grams	Moderate
c	——	100%	1.0 "		35.5 "	Strong

Referring again to equation (1) we find that 1 part by weight of H and 35.5 parts of weight of Cl combine to give exactly 36.5 parts by weight HCl. Therefore, 36.5 grams of hydrochloric acid contains exactly 1 gram of hydrogen and 35.5 grams of chlorine.

Let us now consider a solution of exactly 1 liter volume containing exactly 36.5 grams of hydrochloric acid in distilled water. If the acid is not broken up into ions by the water, that is, if the dissociation of the HCl is zero, as in (2) a, then the entire 36.5 grams of HCl are undissociated, there are no hydrogen ions and no acid properties. If the dissociation is 50% as in (2) b, then there are 18.25 grams of HCl still undissociated, 0.5 gram of H^+ ions, 17.75 grams of Cl^- ions in the liter of solution and moderately acid properties. And finally, if the dissociation is 100% as in (2) c, then all the HCl is dissociated. We will then have 1 gram of H ions and 35.5 grams of Cl^- ions in the liter of solution and strongly acid properties. Thus we conclude that the greater the number of hydrogen ions the stronger are the acid properties.

Again referring to equation (2) we see that the total acid in all cases is 36.5 grams, the quantity which would be determined by chemical analysis and which we shall call the quantity factor. The number of H ions, however, varies with the percentage dissociation and determines the intensity of the acidity, hence the importance of controlling them. This intensity factor, as we shall term it, can not be measured by chemical analysis, but must be determined by other means such as electrometric titration or colorimetric comparison. The colorimetric method is the one used in electroplating control.

In order intelligently to apply these colorimetric methods we should first learn something about the units of measurement which they employ. To do so we must define what is meant by a normal solution.

A normal solution of an acid is one containing 1 gram of hydrogen in a liter of solution. In equation (2) we have 36.5 grams of hydrochloric acid in a liter of solution. This is a normal solution of hydrochloric acid since from equation (1) we find that in 36.5 grams of this acid we have exactly 1 gram of hydrogen.

A normal solution of hydrogen ions, on the other hand, is one containing 1 gram of hydrogen ions in a liter of solution. Therefore, only in equation (2) c, where we have 1 gram of hydrogen ions, do we have a normal solution (expressed 1 or N) of hydrogen ions. In equation (2) b, where we have 0.5 grams of hydrgen ions we have a half normal solution (0.5N) of hydrogen ions.

For convenience the concentrations of hydrogen ions are expressed in terms of pH instead of normality. Table I shows this relationship. A solution one tenth normal (0.1N) in hydrogen ions has a pH or 1, while a solution one hundredth normal (0.01N) in hydrogen ions has a pH of 2. A concentration of hydrogen ions between 0.1N ad 0.01N would have a pH greater than 1 and less than 2.

TABLE I

Relation of normality of hydrogen ions to pH.

Normality	pH
1.0	0
0.1	1
0.01	2
0.001	3
0.0001	4
0.00001	5
0.000001	6
0.0000001	7

One might experience difficulty in understanding an explanation of how the term pH expresses the hydrogen ion concentration, but this knowledge is not essential for its intelligent use. The small numbers serve merely as a simple means of expressing the hydrogen ion concentrations. A pH of 7 corresponds to the hydrogen ion concentration of water at ordinary temperature and represents neutrality—that is, neither acid or alkaline properties. Reference to Figure 1 will show further that any value of pH numerically less than 7 is acid, the intensity of acidity or hydrogen ion concentration increasing as the numbers diminish from 7 to 0. On the other hand,

any value of pH numerically greater than 7 is alkaline and the alkalinity increases as the pH increases from 7 to 14.

Acid zinc solutions operate satisfactorily at a pH of 3.5 to 4.5 according to Thompson.[1]

Nickel solutions operate between the pH values of 5.6 to 6.2. Cleaners, on the other hand, are of course alkaline and their pH will vary from 10 to 14, depending upon their compositions.

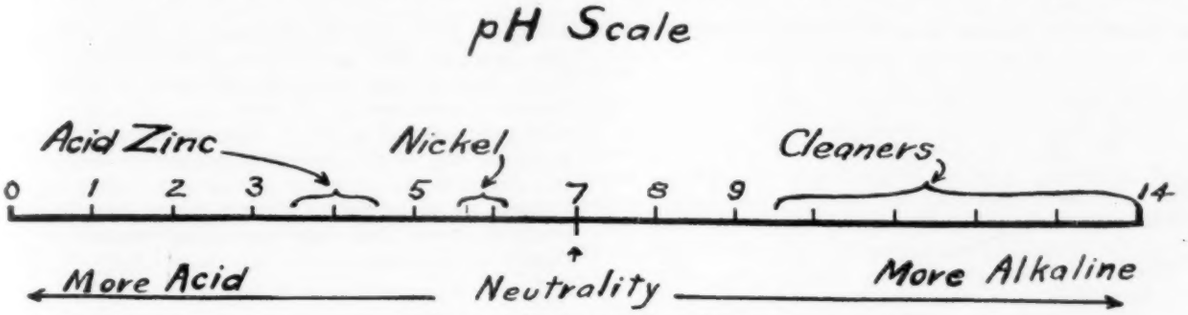


FIG. 1. COMPARATIVE pH SCALE

Let us now consider the difference between a strong and week acid. Reference to Table II will show for a strong acid such as hydrochloric acid that the pH increases (acidity decreases) about 1.0 for a decrease in normality (a dilution with water) of 10, as for example from 0.1N to 0.01N. For a weak acid such as acetic acid the pH increases only 0.5 for the same decrease in normality. This simply means that weak acids give less hydrogen ions than strong acids of the same concentration (normality). Further confirmation of this is to be found in the fact that in Table II, 0.1N solutions of

TABLE II

Normality	Strong Acid Hydrochloric	Weak Acid—Acetic	Weak Acid—Doric
	pH	pH	pH
1.0	0.10	2.37	...
0.1	1.07	2.87	5.10
0.01	2.02	3.37	...
0.001	3.01	3.87	...

hydro-chloric acid, acetic acid and boric acid show a pH of 1.07, 2.87 and 5.13 respectively, indicating different hydrogen ion concentrations for the same concentration (normality) of acid.

In electroplating there are four important factors affecting the pH of the solutions, namely,

Composition of solution
Concentration of solution
Buffers
Temperature.

It has been shown in Table II how the same concentrations of hydrochloric, acetic and boric acids have different pH values and the same will be true of other chemicals used in plating solutions. It has also been shown in the same table that as the solutions of acids are diluted with water, that is, as the normality (concentration) decreases, the pH also decreases.

A buffer is a substance which lessens the change of pH of a solution on the addition of acid or alkali. For instance, alkali carried into a nickel solution from the cleaner might change the pH from 5.8 to 6.4, while if the solution were buffered with boric acid the pH might not rise above 6.0.

While scientists have known that the hydrogen ion concentration of a solution would vary with the temperature, it has only been recently that George B. Hogaboom has called attention to the fact that the present methods of measuring pH colorimetrically disregard this effect of temperature. The seriousness of this omission may be partially realized by reference to Table III.

A solution having a pH of 6.2 at 40° F. has a value of 5.8 at 80° F. This means that it is more acid. This may account for a great deal of the pitting of hot nickel solutions where the pH is determined from a sample which has cooled to room temperature. It is to be recommended, therefore, that colorimetric measurements always be made under the same conditions of temperature in adjusting the acidity of a plating solution.

TABLE III

Temp. °F	pH of Solutions—No. 1	No. 2	No. 3
40	—	6.2	—
80	5.6	5.8	6.2
190	5.2	5.4	5.8

pH measured by La Motte Comparator with Brom Cresol Purple.

In conclusion the writer wants to emphasize the growing importance of hydrogen ion control in electroplating and the necessity for knowledge, on the part of the plater, of the methods of control. The pH control of nickel solutions is becoming universal, its application to acid zinc solutions has commenced and the possibility of extending it to cover industrial cleaners is not far distant.

[1] Trans. Am. Electrochem; October, 1926.

Platers' Itch

By C. G. CUNNINGHAM

I have a few suggestions I thought may be a benefit to platers and others. I have frequently run into rashes or irritations in connection with plating rooms, both in Canada and in the United States and when I was first troubled with them, I couldn't sleep at nights. I began to experiment with various chemicals to see if I could strike one that would stop the itching and dry up the rash. I finally hit on acetic acid and diluted it about 20 to 1. It helped to dry up the sores a little and stopped the perspiring of my hands and also hardened the skin. I finally got the best results from using malt or cider vinegar and water in proportion of one to one or less. I have used it in laboratories and plating rooms. I can not fully explain the reaction of the vinegar but it stopped the itching when the hands or arms were bathed in it, for about 10 minutes or so. I got men in Detroit to use it and also at the Oakland Motor Car Company. One man was troubled badly. His arms, hands, face and neck were in horrible shape and he couldn't sleep. Ointments from the first aid hospital soothed them for a few minutes but then they were worse than ever and spread more. He has given up all ointments since and is better now. Also some of my other men were troubled; one with bad cyanide sores and couldn't sleep and he was also cured.

If the skin starts to crack, cover with plain vaseline.

Electro-Chemical Society Meeting

Abstracts of Papers Read at the Fifty-first General Meeting of the American Electrochemical Society, Philadelphia, April 28-30, 1927

The Reduction of Copper Oxide by Gaseous Reducing Agents

By W. G. Palmer

Copper oxide was distributed in a very thin layer over the surface of a burnt clay support. In the first experiments, carbon monoxide was used as reducing gas. Reduction begins at once at temperatures of 130° C. upwards. It was found that the rate of reduction is not dependent upon the diffusion velocity of the reducing gas through the already reduced copper film, and that the carbon dioxide formed in no way hinders the reduction. These facts held only when the film of copper oxide, to begin with, was very thin. With CO gas pressures above 45 mm., the rate of reduction is independent of the pressure; below 45 mm., it is roughly proportional to the pressure. In the second set of experiments, hydrogen was used as reducing gas. A rapid reduction at first takes place, but the velocity soon drops and the reaction comes to a practical standstill. It appears that the adsorption of the reducing gas to the metal surface is a necessary preliminary to the chemical action of reduction. With hydrogen reduction, the water vapor absorbed on the surface of the copper metal greatly retards the diffusion of hydrogen. The removal of the water vapor film brings about further reduction.

Aluminum from Oersted to Arvida

By Junius David Edwards

Oersted, in 1825, and Woehler, in 1827, produced the first samples of aluminum metal, but it was not until 1886 that Hall invented the process of electrolyzing alumina dissolved in a fused cryolite bath. Hoopes conceived the idea of using aluminum as cable for transmitting electric power. At the new Arvida aluminum plant on the Saquenay River, one million horsepower is available. Autogenous welding of aluminum has greatly extended the field of application of the metal and its alloys. The Hoopes refining cell has produced aluminum with only 0.017 per cent total impurities.

Twenty-five Years of Non-Ferrous Electrothermics; Fifteen Years of Electric Brass Melting

By H. W. Gillett

Aside from electric reduction in fused salts and the making of ferro-alloys, electrothermic reduction of ores of the non-ferrous metals is not commercially practised in America. Electrothermics finds some application in annealing and heat-treatment of non-ferrous alloys, but its chief application is in melting. About 25 per cent of the type metal is electrically melted. Electric melting is practically standard for nickel and its alloys. Around 90 per cent of the output of brass, bronze and nickel silver from the rolling mills and nearly 30 per cent of the output from foundries is melted in electric furnaces. The proportion of electrically melted metal is much greater in the brass industry than in the steel industry. Electric brass melting is now practically standardized upon three specific types of furnaces. Of all the 1,000 individual electric brass furnaces that have been built in America, both for domestic and export trade, more than 80 per cent have been of these three types. About 675,000 tons of brass, bronze and nickel silver were electrically melted in 1926, requiring 180 million kw.-hr.

Electric brass furnaces used $3,000,000 worth of electric energy in 1926; used 40,000 fewer tons of fuel to generate the electricity than would have been used direct in fuel-fired furnaces, and saved 13,500 tons of metal that the fuel-fired furnaces would have lost. The saved metal is worth $2,500,000 a year. The development of electric brass melting to the present point, where about 625 electric furnaces are in active use in the United States and Canada by about 175 different firms, has been wholly brought about by American electrometallurgists and chiefly by members of the American Electrochemical Society.

Bright Dipping of Metal

By A. Kenneth Graham

The author discusses the application of acid dips to copper and brass, and the acid mixtures frequently recommended. A study of the chemistry of dips containing sulfuric, hydrochloric and nitric acids has been made. It was found that the rate of solution of copper varies directly with the nitric acid concentration, while the rate of solution of zinc varies directly with the concentration of hydrochloric acid. The activity of a dip depends upon the proportion of sulfuric acid to water, and upon the temperature. The latter also has a marked effect upon the rate of solution, increasing the rate for copper up to 50° C., while the rate of solution of zinc is decreased. Above this temperature all dips decompose rapidly. Results obtained on copper and zinc separately have been found to apply to both high and low brass. Operating details for bulk dipping of metal are given. Chemical control of dips and mechanical dipping are discussed.

Twenty-five Years' Progress of Electrolytic Zinc

By Oliver C. Ralston

Twenty-five years ago the electrolytic zinc industry was practically non-existent. Today, due largely to the work of the last fifteen years, the world's electrolytic zinc output is 19 per cent of the total zinc output. Elaborate plans are under way for further expansion. The first successful electrolyte was the chloride although today most of the plants are using the acid sulfate electrolyte. Among the valuable by-products that are recoverable are cadmium, vanadium and manganese.

The Properties of Electrolytic Copper Sheets. The Properties of Sheets Deposited on Rotating Cathodes

By S. Sonoda

The behavior of copper sheets electrolytically deposited on a rotating cathode is compared with that of ordinary sheets rolled down from cast squares. The physical properties of the electrolytic sheets were investigated, and a method of annealing and rolling developed which so affected these properties as to produce sheets in every way equal to the ordinary rolled sheets. The simplest procedure consisted in rolling the sheets as they are taken from the cathodes, and then annealing at 400°-600° C.

Pure Zinc

By H. M. Cyr

A comparison of commercial grades of zinc is made with the new product, "spectroscopically pure" zinc, which contains less than 0.0001 per cent of metallic impurities.

"Spectroscopically pure" zinc is prepared by a series of fractional distillations of "chemically pure" zinc under vacuum until the product shows no impurity lines when examined spectrographically. This pure zinc exhibits unusual resistance to tarnishing and to the action of hydrochloric and sulfuric acids, but not to nitric acid. In dilute hydrochloric acid it lost 0.02 per cent by weight in the same time that a similar piece of commercial high-grade zinc entirely dissolved. Its slow rate of solution in these acids can be hastened by the use of a platinum couplle.

The physical properties of "spectroscopically pure" zinc are marked by unusual softness, a low recrystallization temperature, which prevents strain hardening in cold rolling, a melting point of 419.45° C. and a tensile strength of 14,000 pounds per square inch (1,000 kg. per sq. cm.). This metal is being produced in small quantities in the laboratory, and is being used in scientific investigations requiring metal of the highest purity.

Review of Research Work of the Manufacture of Magnesium

By D. B. KEYES

The fused electrolysis of a wide variety of magnesium salts, either alone or in solutions or mixture with other salts, was investigated on a laboratory scale. The salts included the chlorides, fluorides, phosphates, sulfates, carbonates, sulfites, nitrates, and silicates of the alkali metals, alkaline earth metals, aluminum and zinc. The best results were obtained with a bath composed chiefly of magnesium fluoride, together with small quantities of calcium, borium, and sodium fluorides. A special type of cell was developed for the purpose. The magnesium metal obtained was free from undesirable impurities.

Electrolytic Refining During the Past Twenty-five Years

By LAWRENCE ADDICKS

While much progress has been made in practice, considerably greater progress has been made in the theory of electrolytic refining. Twenty-five years ago copper was practically the only metal electrolytically refined on a large commercial scale. Today lead, zinc, gold and silver are refined by very similar processes. The electrolytic treatment of liquors obtained by the leaching of copper ores is now obtaining wide application and will continue to expand rapidly.

The Specific Resistivity of Copper Refining Electrolytes and Method of Calculation

By S. SKOWRONSKI and E. A. REINOSO

The specific resistivity of sulfuric acid at different concentrations and at various temperatures was determined. The effect of the addition of various amounts of copper, nickel, arsenic and iron on the specific resistivity of sulfuric acid, 150 grams per liter, was studied and from the results obtained it was found that within the limits of the composition of electrolyte used in copper refining the effect of copper, nickel, arsenic and iron on increasing the specific resistivity of the electrolyte is directly proportional to the amounts added. Formulas have been derived for each of these metals, Cu, Ni, As and Fe, by the use of which the resistivity of an electrolyte may be calculated from its chemical analysis.

Production of Aluminum in 1926

The value of new aluminum produced in the United States during 1926 was $36,583,000, an increase of less than half of 1 per cent as compared with 1925, according to a statement prepared by J. M. Hill, of the Bureau of Mines, Department of Commerce. Virgin aluminum of 99 per cent grade was quoted at 28 cents a pound until the middle of July, when a decrease to 27-28 cents was recorded, which was lowered to 27 cents the first of September, which level was maintained to the end of the year. The 98 per cent grade was quoted throughout the year at 27 cents a pound. Aluminum bronze powder, as a paint pigment, and aluminum foil were used in increasing amounts. Manufacture of aluminum furniture was further developed during 1926. The electrical industry continued to consume large quantities of the metal, but the automobile industry remained the largest consuming industry.

Imports ("general") of aluminum metal, scrap, and alloy in 1926 increased over 72 per cent as compared with 1925, reaching a total of 74,878,767 pounds, valued at $17,107,690, in 1926. Imports of plates, sheets, and bars increased 24 per cent, amounting to 127,202 pounds, valued at $36,776, in 1926. Hollow ware imports in 1926 totaled 215,265 pounds, valued at $99,458. Total imports of aluminum in 1925 were valued at $10,536,639 and in 1926 at $17,502,435.

Exports of aluminum ingots, scrap, and alloys in 1925 were 8,130,222 pounds, valued at $1,835,213, but in 1926 were only 586,749 pounds, valued at $137,980. Exports of plates, sheets, bars, etc., in 1926 were over 56 per cent greater than the quantity sent abroad in 1925, totaling 7,047,422 pounds, valued at $1,997,107, but exports of tubes, moldings, and castings decreased 41 per cent. Table and other manufactured ware exported declined 16 per cent in value, but other aluminum manufactures increased 29 per cent in value. The total exports of aluminum in 1925 were valued at $6,057,071 and in 1925 at $4,452,303.

An important event in the aluminum industry was the formation late in 1926 of a European Aluminum Cartel, composed of all the principal producers of Europe, including the French, English, German, and Swiss makers of aluminum. While the Italian firms are not nominally in the cartel, the trade believes their movements will probably be more or less in accord with the cartel, for they are largely controlled by companies in the agreement. It is estimated that the cartel controls about 47 per cent of the total world producing capacity for a period of two years, the life of the present agreement.

JAPANESE ALUMINUM

According to a report published in The Iron Age, the Japanese government has offered a subsidy of $150,000 a year to a group of private interests to begin manufacturing aluminum at the rate of 1,000 tons per year. The demand for aluminum in Japan is increasing rapidly but none is produced in that country. In 1926 about 8,000 tons were imported, of which more than half was supplied by the United States. The decision of the manufacturers hinges on the question of the cost of production. Estimates so far have varied from 27½ to 34¾ cents per pound. The price of imported aluminum including the tariff is about 27.64 cents.

In the opinion of one expert on aluminum, this venture would have small chance of success. The Oriental Aluminum Company, formed by the Aluminum Company of America, about six years ago, was abandoned because, after investigation, the promoters did not see how they could pay their way.

American Foundrymen's Association Meeting

1927 Convention at Edgewater Beach Hotel, Chicago, Ill., June 6th to 10th, 1927

SCHEDULE OF SESSIONS ON METALS

June 6

Registration.
Plant visitation.
Committee meetings.
6:30 Conference of instructors of foundry practice.

June 7

8:00 a.m. Breakfast gatherings — promoting acquaintanceship.
10:15 a.m. Apprentic Training.
2:00 p.m. Foundry costs.
Evening: General entertainment feature.

June 8

8:00 a.m. Breakfast gatherings — promoting acquaintanceship.
10:00 a.m. Foundry sand control.
12:15 p.m. Round table—Non-ferrous foundry problems.
4:00 p.m. Business meeting.
6:30 p.m. Banquet.

June 9

8:00 a.m. Breakfast gatherings — promoting acquaintanceship.
10:00 a.m. Non-ferrous founding.
Boat trip.

June 10

Plant visitation.

TECHNICAL SESSIONS

June 7

10:15 a.m. APPRENTICE TRAINING.
Chairman: H. A. Frommelt, Davenport, Iowa.

2:00 p.m. FOUNDRY COSTS.
Chairman: A. E. Hageboeck, Frank Foundries Corporation, Moline, Ill.

June 8

10:00 a.m. FOUNDRY SAND CONTROL.
Chairman: Benj. D. Fuller, Cleveland, Ohio.
Some Practical Results of Sand Control, M. Kuniansky, Lynchburg Foundry Company, Lynchburg, Va.
Report of Committee on Grading Foundry Sand,
Chairman: A. A. Grubb, Ohio Brass Company., Mansfield, Ohio.
Report of Committee on Testing Foundry Sands.
Chairman: H. Ries, Cornell University, Ithaca, New York.
Effect of Moisture Absorption on the Properties of Cores,
H. L. Campbell, Ann Arbor, Mich.

12:15 p.m. ROUND TABLE CONFERENCE ON BRASS FOUNDRY PROBLEMS.
Chairman: N. K. B. Patch, Lumen Bearing Company, Buffalo.
The Round Table conference will follow a luncheon gathering of those interested in brass founding.

June 9

10:00 a.m. NON-FERROUS FOUNDING.
Chairman: N. K. B. Patch, Lumen Bearing Company, Buffalo, New York.
Reduction of Molding Losses, R. A. Greene, Ohio Brass Company, Mansfield, Ohio.
Aluminum Bronze Castings, W. M. Corse, Aluminum Bronze Manufacturers' Institute, Washington, D. C.
Gating Brass Castings—A conference on various methods of gating brass castings.

ATTENDANCE CONTEST

The Board of Directors announce the inauguration of a convention attendance contest. Points will be figured on mileage traveled one way. For instance, the distance from Detroit to Chicago is 273 miles. The total mileage for 33 members would be 9,009 miles. The distance from Boston to Chicago is 1,021 miles. The total mileage for 9 members would be 9,189 miles, giving Boston a margin of 180 points.

For complete information address the Secretary of the American Foundrymen's Association, 140 S. Dearborn St., Chicago.

Electro-Platers' Convention

Plans for the annual convention in Toledo, Ohio, June 29-July 2 are progressing rapidly. A tentative program has been blocked out, including several papers on chromium plating, cleaning, coloring, oxidizing and etching. Reports will be received on the progress of the investigation into spotting out and the other researches on electro deposition at the Bureau of Standards.

The program as arranged to date is as follows:

Nickel Anodes. George B. Hogaboom.

The Chromium Situation from a Practical Standpoint. E. G. Lovering.

Industrial Cleaner. P. J. Benoliel.

Lacquers. Dr. R. Breves.

Chromium Plating. C. Van Deran.

Oxidizing and Etching of Metals. Frank Leob.

Some Odd Coloring on Metals. T. A. Gardner.

Recent Advances in the Commercial Electro-Plating of Chromium. Charles H. Proctor.

Cleaners and Cleaning. John A. Carter.

A Summary of Research on Electro-deposition at the Bureau of Standards. Dr. Wm. Blum.

A Program Report on the Investigation Spotting Out. W. R. Barrows.

Methods of Chromium Plating. H. E. Haring.

Application of Chromium Plating. Dr. Wm. Blum.

Research Development and Standardization of Finishing Processes and Methods. C. Van Deran.

Chromium Plating. J. K. Preston.

THE METAL INDUSTRY

With Which Are Incorporated
THE ALUMINUM WORLD, COPPER and BRASS, THE BRASS FOUNDER and FINISHER
THE ELECTRO-PLATERS' REVIEW

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EDITORIAL

ASSAYS AND UMPIRES

One of the factors which must be watched with utmost care by all concerned in the smelting and refining industry is the matter of assays. It is a condition peculiar to this industry alone that the value of the commodities dealt with is unknown until after shipment and receipt. The seller of sweeps, waste and other metal bearing materials has no exact knowledge of its value, and neither has the purchaser, until the shipment has been carefully sampled and the samples assayed. Sampling has become more of a science than an art, as it used to be, but at best it is only a matter of scientific estimating. Only by the merest accident can the calculated value of materials be exactly the same as the actual metal content. High and low grade spots may exist in the lot of material which will either miss or be included in the sampling, consequently changing the assays to make them either too low or too high.

To the seller of such materials in the secondary metal trades, these differences will mean greater or less returns. But they are not of the greatest importance because the primary business of such sellers is manufacturing, and the revenue obtained from the sale of waste materials is only an additional income, of greater or less importance, as the case may be. To the purchaser of these materials, the smelter and refiner, the accuracy of assays is a matter of life and death. His primary business is the purchase of these materials, the payment for values contained, the recovery of these values and their sale in the form of pure metals. Consequently, if errors are made they effect the main source of his income. The business life of a smelter depends to a large extent upon the correctness with which the values are determined in materials purchased by him.

The common practice in sampling is, after the final cut-down sample has been obtained, to divide this into several parts. One is to be assayed by the smelter, another by the seller, a third to go to the umpire in case of differences, and a fourth to be held in reserve. It is hard to say just what percentage of the assays are sent to umpire but the chances are that it is large enough to be of importance. Consequently, upon the honesty and accuracy of the umpire rests, in many cases, sums running up into many thousands of dollars.

There is another element involving the question of methods of assaying. Losses occur in assaying even as in smelting, and consequently numerous sellers insist on what is known as the "corrected assay." This correction consists in re-assaying the slags and cupel bottoms used in making the original assay to determine the amount of metal which has been absorbed by them. Some metal is always found, but it is known that these corrected assays are apt to be too high because of the fact that the precious metals recovered contain some lead used in the analysis. It is the claim of the smelters that the corrected assays credit the material with higher values than actually exist. It is the counter claim of the sellers that the uncorrected assays do not show the full value of materials. The right answer may lie somewhere between them but analytical methods do not yet tell us the exact truth.

In connection with this situation, the opinion of A. M. Smoot, vice-president and technical director of Ledoux and Company, the well known assayers, will be of interest. In an article in the Engineering and Mining Journal-Press for October 17, 1925, Mr. Smoot states:

"It will be seen that while uncorrected assays are nearly always below the true precious metal contents of any ore or furnace product, corrected assays, made by re-assaying cupels and slag, are likely to be above the true contents . . . Corrected assays as usually conducted are a little nearer the truth than uncorrected assays but the error is in the opposite direction."

It is the contention of the sellers that they should be paid for everything in their material, but it is the counter-contention of the smelters that seldom if ever can they recover absolutely all of the metals shown by even the uncorrected assay. If corrected assay is insisted upon, the smelter must protect itself by increasing refining charges and making greater reductions for metallurgical losses.

The result of this situation, the vast importance of assays and the impossibility of agreement, has been unending argument, bickering, and umpire assays. Methods of analysis of course, vary to a certain extent, and some will get higher results than others. The seller is constantly calling for higher results, naturally enough, and the purchaser, hoping for lower assays.

It seems that a plan to eliminate these troubles should not be impossible to draw up. There will always be differences in assays but this should make it not only more advisable but actually easier to draw up such a plan. In a general way, the materials shipped to smelters are known and fairly standardized. Schedules are now drawn up covering these materials with definite smelting charges, payment for values and penalties for impurities. Differences in assay results should be referred to umpires whose business is umpiring only. These umpires should have no financial relations with either shippers or smelters and be under no obligations to either side. Perhaps a Government bureau or a trade association would be the most desirable for this purpose.

To determine the rights and wrongs of every case is neither possible or particularly desirable. Doubtless many errors have been made by both sides, but they must be equally anxious to keep their business dealings on equitable basis. According to reports from the trade, it is vital to the smelters. Certainly a fair plan could be worked out co-operatively which would result in better relations and better business for all concerned.

CRAMP ABANDONS SHIPBUILDING

American industry has been surprised by the recent announcement that the William Cramp and Sons Ship and Engine Building Company of Philadelphia, Pa., is to abandon the building of ships. The naval and merchant marine depression caused by overbuilding in war times has made it impossible to operate their great plant with its consequent overhead, with insufficient work to keep it busy.

The various subsidiary organizations of the company will be continued, however, as they are in good financial condition, and most of the old employees will be retained. These subsidiaries include Cramp's Brass and Iron Foundry the brass department of which was described in THE METAL INDUSTRY for January, 1927.

The Cramp company is one of the oldest in the United States. Ninety-seven years ago, in 1830, William Cramp established a small yard, on the site of the old Hope farm on the Delaware River near Philadelphia, to build wooden ships. His business grew steadily and in 1872, the William Cramp and Sons Ship and Engine Building Company was incorporated in Pennsylvania under a perpetual charter. It had become one of the greatest shipbuilding organizations in the United States and played a very important part in American naval history. The steam frigate, New Ironsides, the monitors, Yazoo and Tunis, the double end gun boat, Wyalusing, and the screw steamship Chattanooga, helped to win the Civil War. Later, the White Squadron built by the Cramp company included the New York which figured in the battle of Santiago. The South Carolina and the Vesuvius were also built there. During the World War the Cramp yards built 48 torpedo boat destroyers and a number of ships for foreign powers. A number of pleasure yachts and commercial ships also appear on the company's records.

In its activities the company expanded and acquired interests in other lines and more or less directly related to shipbuilding. The De La Vergne Machine Company, the I. P. Morris Corporation, Pelton Water Wheel Company, Federal Steel Foundry Company, Cramp's Brass and Iron Foundry, and the Cramp Engine Manufacturing Company cover operations including the manufacture of Diesel engines, castings, hydraulic, hydro-electric and other power machinery. Its growth is shown by the fact that the present capital stock of the company is over $15,000,000 and the total assets are over $22,000,000.

Of course, every industry has its ups and downs and its high and low points. In this day of speed and rush we cannot afford to lose time mourning for the conditions of yesteryear. But it is saddening to see one of the oldest, largest and best representatives of any line give up the fight. Doubtless, the company is doing only what is best for all concerned. There are too many ship yards and too many ships and no one knows when prosperity will return in marine work. But there has always been a romance to shipbuilding and an air attached to it shared by no other activities. Ships are more than things, and the yards that build ships seem to partake of their qualities.

Philadelphia particularly will mourn the passing of the Cramp ship yards even though the other Cramp industries prosper. The marine business will say, "Hail and Farewell," and wish the Cramp company the best of luck in its new fields. The metal trades will take comfort from the fact that the brass foundry and the other branches of the Cramp business which are large consumers of metals are going on as heretofore and are flourishing.

FOUNDRYMEN'S CONVENTION

The annual convention of the American Foundrymen's Association will be held in Chicago, Ill., June 6-10. We wish to call foundrymen's attention to the fact that this is a technical meeting with special sessions to care for all the various branches of the foundry industry. The nonferrous foundries will be well represented; there will be plants to visit, social functions and entertainments. The usual arrangements have been made for reduced railroad rates.

We urge foundrymen and foundry executives to attend this convention as there will be numerous special meetings of interest, not only along the regular lines of brass founding, but also on sand control, apprentice training and foundry costs, which are of vital interest to all foundries.

ELECTRO-PLATERS' CONVENTION

The annual meeting of the American Electro-Platers' Society will be held in Toledo, Ohio, June 29-July 2. It is not too early to remind members of the Society to make their plans to attend this convention, nor is it too early to remind the employers of plating foremen and executives in whose charge are plating departments, that their foremen should attend the convention whether they are members or not. It should not be considered a vacation or a pleasure jaunt, but an important and integral part of the platers' work to be present at these meetings.

Progressive employers are becoming convinced in greater numbers that it is to their financial interest, not only to allow their plating foremen the time to attend this convention, but also to pay for the time and expenses of the man or men whom they send. If the plater is sent by his company, he is actually working for it, like a salesman on the road. He can be required to make full and adequate reports of the meetings and it is not only possible but likely that information picked up at the meetings or by personal contact, will return the costs of this trip to the employer many times over.

In a word, our injunction is to send a representative to the platers' convention.

GOVERNMENT PUBLICATIONS

Carbon Brushes and Brush Shunts. Simplified Practice Recommendation No. 56. U. S. Department of Commerce, Washington, D. C. Price 5 cents.

U. S. Government Master Specification for Plumbing Fixtures (for land use). Federal Specifications Board Specification No. 488. Circular of the Bureau of Standards No. 310.

This circular covers the specifications for plumbing fixtures of all kinds as established by the Government for its purchases of the following materials: enameled ironware; trimmings and fittings; supports and fastenings; compression stops; ball cocks; flushing tank mechanism; flushing valves; fixture connections; interior down-spout gooseneck; roof drains, pipe sleeves; floor, wall, and ceiling plates; piping; hangers, supports, etc.; valves.

New Books

Ancient Egyptian Metallurgy. By Major H. Garland and C. O. Bannister. Published by Charles Griffin & Company, Ltd. Size 5 x 7½; 214 pages. Price $5.

The history of metals has always had a fascination peculiar to the industry. Few other arts have such a broad background and such wide associations, both historic and cultural. The present-day worker in metals can gain an excellent general education for himself by centering his reading and study about the metals which he uses in his everyday work.

The special points brought out by this book are the microscopical examination in the study of ancient specimens; the probability of a much earlier iron age in Egypt than that generally accepted; the early use of the "Cire-Perdu" brass for casting and the comparatively late use of cold working and annealing for the shaping of manufactured products. In other words, casting is an old art but fabricating is a new one.

The book is profusely illustrated and will make not only interesting but useful reading. Some of the subjects covered are as follows: Sources of Metals to the Egyptians; The Bronze Industry of Ancient Egypt; The Iron Age in Egypt; Ancient Egyptian Tools; The Metallography of Antique Metals; Cleaning, Preservation and Repairing of Antique Objects.

Securing Employment for the Handicapped. By Mary La Dame. Published by the Welfare Council of New York City, 151 Fifth Avenue. Size 6x9; 133 pages. Price 50 cents.

This is a study of placement agencies for handicapped people made for the Russell Sage Foundation. It deals with the problem with which employers and managers are frequently concerned and although made in New York City, many of its problems are common to other parts of the country. The question of handling those who have been handicapped by accidents or at birth is important enough to be given serious attention by every large employer of labor and there is no more worthy or practical service than aiding in the rehabilitation of such unfortunates.

Galvanizing. By Dr. Heinz Bablik. Published by E. and F. N. Spon. Size 5½ x 8½; 168 pages. Price $5.00.

"Galvanizing" is a theoretical and practical treatise on the subject of zinc coating for the use of works managers, students and others. The author is the manager of a large zinc coating works in Austria and as such has had ample opportunity to collect data based on practical working experience.

The book in addition, gives full explanations and reasons of the author's processes involved, combining in this fashion theory and practice. Chapters are as follows:

Rust and Its Prevention; Structure of Galvanized Coatings; Hot-galvanized Coatings; Electro-galvanized Coatings; Sherardized Coatings; Schoop Coatings; Pickling; The Flux; Hot-galvanizing; The Galvanizing Tank; The Galvanizing Process; The Austrian Galvanizing Process; Galvanizing Cast Iron; Raw Materials and Waste Products of Hot-galvanizing; The Theoretical Principles of Electro-galvanizing; Electro-galvanizing Plant; Sherardizing; The Schoop Process; Testing and Judging Galvanized Coatings; Mechanical Properties; Method of Galvanizing; Thickness of Coating; Action of Corrosives.

Two Lectures On the Development and Present Position of Chemical Analysis by Emission Spectra. By F. Twyman. Published by Adam Hilger, Ltd., 24 Rochester Place, London, N.W. 1, England. Size 6x 9½; 43 pages.

Lecture 1. The Discovery and Development of Spectrum Analysis.

Lecture 2. (a) Producing, Observing and Photographing Spectra. (b) Measuring Wavelengths, Identifying Metals by Their Emission Spectra, and Application.

These lectures were delivered before the Sheffield Metallurgical Association in December 1924, and are recommended for the use of teachers in chemistry, etc.

TECHNICAL PAPERS

Aluminum and Its Alloys. By Dr. Zay Jeffries. A paper read before the Cleveland, Ohio, section of the American Society of Mechanical Engineers. Dr. Jeffries discussed the use of various types of aluminum in different industries and described the most important types of materials used. Nearly pure aluminum is used in the manufacture of sheets, tubes, extrusion products, wire, foil and as a base material for powder for the paint industry. Pure aluminum can be cold worked up to a tensile strength of 35,000 pounds.

The most important binary alloys are aluminum-copper, aluminum-manganese and aluminum-silicon. Copper bearing alloys contain generally about 8% copper. Some use 1½% zinc and some 5% silicon. Up to 13% silicon can be used.

In the wrought alloys of aluminum, heat treatment has resulted in obtaining tensile strengths up to 63,000 pounds. A strong aluminum alloy containing manganese is made into various fabricated forms. A "super-Duralumin" alloy has been produced having tensile strength up to 75,000 pounds.

Relationships Between the Rockwell and Brinell Numbers. By S. N. Petrenko. Technologic Papers of the Bureau of Standards, No. 334. Department of Commerce, Washington, D. C.

Comparative Rockwell and Brinell tests were made on a great variety of ferrous and non-ferrous metals.

The theoretical relationships between the Brinell and the Rockwell numbers may be expressed by the equations.

$$\text{Brinell number} = \frac{\text{Constant}}{130 - \text{Rockwell ball number}}$$

and

$$\text{Brinell number} = \frac{\text{constant}}{(100 - \text{Rockwell cone number})^2}$$

The experimental values of Brinell and Rockwell numbers were inserted into these equations and the constants determined. These theoretical equations with the experimentally determined constants may be used to estimate, within an error of plus or minus 10 per cent, the Brinell number from the Rockwell number. Similar equations were obtained for the tensile strengths of steels, which may, within an error of plus or minus 15%, be estimated from the Rockwell number.

The Vertical Ring Induction Furnace. By William Adam Jr., Ajax Metal Company, Philadelphia. Presented at the Industrial Electric Heating Conference, Pennsylvania State College, January 14, 1927.

The author describes the construction and operation of the vertical ring induction furnace, referring especially to the Ajax-Wyatt furnace, widely known in the brass industry. The requirements of an ideal furnace are listed and the Ajax furnace is discussed with reference to these requirements.

Thermal Expansion of Graphite. By Peter Hidnert and W. T. Sweeney. Technologic Papers of the Bureau of Standards. No. 335. Price 5 cents.

This paper gives the results of an investigation on the thermal expansion of longitudinal and transverse sections of artificial graphite electrode (99.2 to 99.7 per cent carbon) over various temperature ranges between room temperature and 600° C.

In the present investigation the coefficients of expansion of graphite were found to be low. The transverse samples expand considerably more than the longitudinal samples (approximately 45 per cent). For both the longitudinal and transverse samples the coefficients of expansion decrease slightly as the purity (carbon content) increases. The table in the summary gives a resume of average coefficients of expansion derived from the data on all samples for various temperature ranges between 20 and 600° C.

The Annealing of Copper. By N. R. Stansel. Published in General Electric Review, May, 1927.

A description of the changes in grain structure, recrystallization temperature, proper conditions for annealing furnaces and an example of energy requirements. This article contains useful data particularly on electric furnace annealing of copper in order to give it the physical characteristics suitable for rolling and working into various shapes.

SHOP PROBLEMS

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE

ASSOCIATE EDITORS { JESSE L. JONES, Metallurgical; WILLIAM J. PETTIS, Rolling Mill; W. J. REARDON, Foundry; W. L. ABATE, Brass Finishing; CHARLES H. PROCTOR, Plating Chemical; P. W. BLAIR, Mechanical

ANTIQUE BRASS

Q.—I would appreciate a little information about the oxidized and antique finishes of brass.

1. An oxidizing dip which I can scratch brush and lacquer to represent an antique finish on brass plated steel tubing.

2. To produce a finish with the electro type for sand blast antique finish.

A.—One of the best all-around oxidizing solutions for your purpose is as follows:

Water	1 gallon
Hyposulphite of soda	8 ozs.
Lead acetate	4 ozs.
Soda ash 58%	½ oz.

Temp. 180 deg. F. This solution is best adapted for brass plated steel surfaces because it does not have any reducing action upon the brass plated deposit.

Sand Antique Brass Finish. The best surface in the production of this finish is a sand blasted one, whether the base surface is of steel or brass. Satin finishing steel wire brushes are sometimes used. The swing type is the best satin finishing steel, but such methods are expensive. If you have steam at your disposal, you can readily rig up a portable sand blast that will, no doubt, answer your purpose.

The arrangements should be as follows:

1. Connect rubber hose of sufficient length to a steam line with valve connection.

2. On the outlet end connect a nozzle of the water sprinkling type, such as used in watering lawns; the steam pressure can be adjusted the same as the water with such a nozzle.

3. To the brass nozzle, connect a good sized funnel with small outlet so that the liberated sand when placed in the funnel will drop in front of the ejected steam from the nozzle. The force will carry the sand to the articles to be sand blasted and will give you results desired.

4. Before sand blasting apparatus was invented the writer used the method described for sand blasting nickel plated copper sheets, 24 x 52 inches in dimension.

5. The sand blasting can be applied before or after plating the steel. You can decide this matter yourself.

6. After relieving the oxidized surfaces with either cloth buffs or Tampico brush wheels and pumice stone, and thorough washing and drying, lacquer the articles with a brush brass lacquer.—C. H. P. Problem 3,635.

COPPER SOLUTION

Q.—Can you send me formula for copper solution containing following chemicals: acetate of copper, potassium cyanide; bicarbonate of soda, and any other that may be necessary.

A.—A copper solution such as you mention is not used any more in commercial electro-plating operations. The cost of potassium cyanide, which contains ⅓ less cyanogen as the active factor than sodium cyanide, is three times greater than the latter material.

The following formula will give you ideal results in cyanide copper plating:

Water	1 gallon
Sodium cyanide 96-98%	4 ozs.
Copper cyanide 70% metal	3 ozs.
Bisulphite of soda	1½ ozs.
Caustic soda 73-76%	½ ozs.
Hyposulphite of soda	1/32 oz.

To prepare the solution, use ⅓ the water first, heated to 160 deg. F. Dissolve therein the sodium and copper cyanide. When dissolved, add the balance of the water cold; add the other materials with constant stirring in the order given. Use cast or soft rolled copper anodes. Voltage of solution, 3 to 4; temperature 110°-120° F.; amperage 15 to 25 per sq. ft. of surface area.—C. H. P. Problem 3,636.

CLEANING NICKEL SILVER

Q.—Kindly advise how to clean nickel silver wires after they have been soldered and pickled to give them the bright color as the pickle tarnishes it so much. We cannot do any plating on it as it is soldered to certain gold ornaments.

A.—We presume that borax is used as the flux. If so, we suggest that your pickling be done in a solution consisting of water, 1 gallon; hydrofluoric acid, 1 oz., temperature 200 deg. F. It is possible that a short immersion in this pickle will reduce the brazing flux and leave the nickel silver clean.

If not, then prepare an acid dip as follows:

Water	1 gallon
Sulphuric acid 60°	1 gallon
Nitric acid 38°	1 gallon
Water	1 pint
Muriatic acid	1 oz.

Mix the acid in the order given, then let them cool down to normal temperature; immerse the nickel silver in the acids for a moment; wash in water and dry out.—C. H. P. Problem 3,637.

GRAY-BLACK ON PEWTER

Q.—I wish to produce a dull, deep gray-black finish on pewter. Muriatic acid, which I have been using heretofore does not give the desired effect. Can you enlighten me on this subject?

A.—To produce an antique finish, gray-black on pewter, try the following solutions.

No. 1:

Water	1 gallon
Caustic soda 73-76%	4 ozs.
White antimony oxide powdered	½ oz.

Temp. 120 deg. F.

No. 2:

Water	1 gallon
Hyposulphite of soda	8 ozs.
Lead acetate	4 ozs.
Soda ash 58%	½ oz.

Temp. 160-180 deg. F.

Immerce the articles made of pewter in one or the other solutions for a moment or two, then wash and dry and relieve as is desirable.—C. H. P. Problem 3,638.

IRON SOLUTION

Q.—Will you please send us the formula for iron plating stainless steel?

A.—One of the best iron plating solutions and the easiest to control is prepared from the following material: Water 1 gallon; iron ammonium sulphate 3 pounds. Temperature 110 deg. F., voltage 3 to 4; anodes, soft sheet steel. The anodes should be in excess of the articles to be plated in surface area. It is advisable to have the cathode rod mechanically moved if the plating operations are to be continuous.

This solution is used extensively in the building up of worn cam shafts, etc., with iron.

To prepare the solution, dissolve the iron salts in water at 180 deg. F., then let it cool down to normal temperature, 110-120 deg. F.—C. H. P. Problem 3,639.

NICKEL ON ALUMINUM

Q.—Will you kindly advise me if it is possible to nickel plate aluminum. If so, would be pleased to receive information how same is done.

A.—The secret in nickel plating aluminum so as to obtain an adhesive non-peeling nickel deposit is to prevent oxidation of the

aluminum surface after cleansing. This can readily be accomplished if the aluminum articles, after polishing and cleansing under usual conditions, in operation in the plating department, are immersed in a solution consisting of:

Nitric acid 38°	1 gallon
Sulphuric acid 66°	1 gallon
Perchloride of iron	2 ozs.

The iron salt should be dissolved in about 4 ozs. hot water before mixing with the acids. The theory of action of the acid dip as above outlined is that aluminum oxide on the surface of the aluminum articles after cleansing, is reduced by the acids and is replaced by an almost invisible film of iron which protects the surface of the aluminum articles from oxidation.

Any good formula for nickel solution will give satisfactory nickel deposits following the treatment of the aluminum articles as outlined. C. H. P., Problem 3,640.

NICKEL PLATING COST

Q.—We expect to put in a small nickel tank of ten to twenty gallons. Could you give us a formula and cost of same?

A.—We suggest the following formula for a 10 or 20 gallon nickel plating solution for your purpose.

Water	1 gallon
Double nickel salts	8 ozs.
Single nickel salts	2 ozs.
Ammonium chloride	2 ozs.
Boracic acid	1 oz.

Anodes, cast nickel 95-97 per cent. You would require about 4 anodes, 6" x 12" x ½" thick. The voltage required is 3 to 4, amperage 5 per sq. ft. of surface area. Temperature 80° F.

To prepare the solution, dissolve the salts in the order given in boiling hot water, then let the solution cool down to 80° F. The solution as outlined will not cost more than 15 cents per gallon for 10 to 20 gallons. Large quantities of solution would not cost more than 9 cents per gallon. Anodes will weigh 4 to 5 lbs. each and will cost a minimum of 50 cents per lb. for such a small quantity. You will require electric current. You might be able to use a 4-volt 50-ampere storage battery with a battery charger. The regulation of the flow of current would have to be controlled by a suitable rheostat. There are a number of electroplating supply houses in your district who can furnish material and anodes. See the advertising pages of THE METAL INDUSTRY.—C. H. P., Problem 3,641.

POLISHING STEEL

Q.—We would like to inquire from your Shop Problems Department if they have had any experience in connection with the polishing of steel buckles. If so would like to have their experience as to the best kind of brush and polish to use; also how rust is removed.

A.—To remove rust from cut steel buckles, immerse them in a solution consisting of water, 1 gallon; caustic potash, 4 ozs.; temperature 180-200 deg. F., for 20 minutes. Remove and wash in cold water; immerse in the following acid dip for a moment.

Water	1 gallon
Muriatic acid	1 pint
Chloride of tin	1 oz.

Temperature 160° F.

As soon as the rust is removed, wash thoroughly in cold and boiling water; dry out in sawdust.

To refinish, use sheepskin buffs. The polishing medium should be tin oxide mixed with equal parts of kerosene and denatured alcohol to a plastic heavy paste; to make it more adhesive to the buff wheel, add some glycerine, 1 oz. to 8 ozs. of above mixture. The back of the buckles could be polished with the aid of a small bristle brush wheel to prevent cutting away the heads of the rivets which hold the cut steel front of the buckle to the nickel plated brass back. After polishing, cleanse very carefully in gasoline or benzine to maintain the lustre.—C. H. P., Problem 3,642.

ROUGH CASTINGS

Q.—We are forwarding by parcel post a faucet. Lately we had considerable trouble owing to the drag side of the mold coming very rough. The cope side seems to be nice and smooth and we have tried several remedies, but have not been successful in overcoming the roughness and pitting.

A.—On examination of sample furnished we find the casting full of dirt and under the glass it is not only in the drag side, but also in the cope side. This dirt comes from one of two causes: The molding sand washes, not being the proper grade of sand for brass work, or the sand is used too wet and causes what is known as scabbing, that is the sand peels off. When the metal strikes the sand it jumps and the sand peels off and is washed in through the mold; hence a dirty casting. Your difficulty appears to be of this nature and you should use a fine, open grain sand similar to No. 2 Albany sand for your class of work. Never add sea-coal to molding sand for brass work as brass is a much heavier metal than iron and will eat in and cause rough, dirty castings.

Your sand is the most important item in molding heavy and light castings that require a fine finish. Others in which the finish is unimportant all fall into different classifications. Steel, malleable iron, gray iron and brass melt at different temperatures and involve the use of sand possessing refractories in various degrees. The relative porosity of the sand is an important factor in taking care of the gases generated under certain conditions in the refractories. We suggest you have the proper grade of molding sand and flour the drag side of the mold by dusting a good grade of flour through a dusting bag. Blow off the excess. Use your molding sand as dry as consistent for good molding practice and do not ram too hard.—W. J. Reardon. Problem 3,643.

TANK LINING

Q.—Will you please publish a formula for lining a tank for a nickel solution. I have lined them with pitch, but it is brittle and often cracks at the joints and corners. Is it a good idea to mix coal tar with the pitch? If so, what proportion would be best?

A.—In lining wooden tanks the following procedure should be followed if the tank is new or has been previously used.

1. Cover the sides and ends of the tank with galvanized iron wire, square mesh, used in poultry pens, etc.
2. Secure the wire netting with small wire staples.
3. Melt asphalt pitch to the boiling point, then temper with a little coal tar addition so that the brittleness you complain of will be avoided.
4. I is best to make the cold water test as one does in making sugar taffy. When the mixture is dropped into cold water and is found to be too brittle when bent, then add a little more coal tar to the pitch.
5. Avoid an excess, however, because the softer the mixture the lower its melting point.
6. When all is ready, lay the tank down on its side and have it perfectly level. Nail a strip of wood about ⅜ in. thick along the edge of the tank to regulate the thickness of the pitch mixture, when flowed in, ¼ in. to ⅜ in. thickness of pitch should be ample.
7. Treat the other side and the ends the same way. Finally, when they are cool, level up the tank and pour the mixture into the bottom to give ⅜ in. to ½ in. thickness.—C. H. P. Problem 3,644.

TIN SOLUTION

Q.—Will you kindly publish in THE METAL INDUSTRY or advise the best electro tin solution used in an oblique plating barrel; also regarding the anodes, as to composition.

A.—One of the best electro-tinning solutions adapted for your purpose is as follows:

Water	1 gallon
Sodium stannate	28 ozs.
Tin chloride	1 oz.
Powdered rosin	1 oz.
Caustic potash	1 oz.

The powdered rosin should be dissolved in the caustic potash, dissolved in 8 ozs. water, then heated until all is dissolved and mixed thoroughly in the tin solution. Use pure tin anodes backed up with sheet steel, twice the surface area of the work. Voltage, 4 to 5; amperage 25 per sq. ft. of surface area. The solution should be operated at not less than 80 deg. F.; the higher the temperature the quicker and better the results. Regular horizontal plating barrels can be used to advantage with this type of solution. This form of solution is used extensively in tin plating foundry chaplets and similar products made of steel, etc.—C. H. P. Problem 3,645.

PATENTS

A REVIEW OF CURRENT PATENTS OF INTEREST

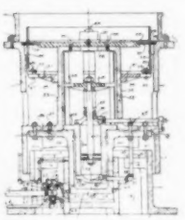
1,620,081. March 8, 1927. **Alloy of Lithium and Aluminum.** Johann Czochralski and Georg Welter, Frankfort-on-the-Main, Germany, assignors, by mesne assignment, to Allied Process Corporation, New York.

As a new article of manufacture, a structural element formed of an aluminum base alloy substantially free from silicon and containing an appreciable amount of lithium up to 40 percent thereof.

1,620,082. March 8, 1927. **Aluminum Alloy Containing Lithium.** Johann Czochralski, Frankfort-on-the-Main, Germany, assignor, by mesne assignments, to Allied Process Corporation, New York.

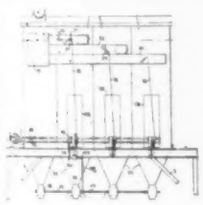
The hereindescribed alloy consisting predominantly of aluminum and substantially free from silicon, and containing an appreciable amount of lithium in less proportion than one-half of one per centum.

1,621,114. March 15, 1927. **Molding Machine.** Walter J. Irvin, Akron, Ohio.



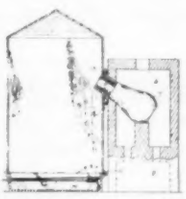
In a device of the character described, a suitable base embodying a vertically disposed pressure cylinder, a hollow cylindrical member operatively mounted therein, an outer cylindrical wall and a tubular center post supported thereby, a table comprising a flange on said wall and a circular plate on said post, a cylindrical pattern concentrically arranged between said post and said flange, means to raise and lower said pattern so that a portion thereof will project above said table and means to utilize fluid pressure to cause a vertical jolting movement of said cylindrical member in said cylinder.

1,621,824. March 22, 1927. **Dust Arrester.** George A. Boesger, Cleveland, Ohio, assignor to The W. W. Sly Manufacturing Company, Cleveland, Ohio.



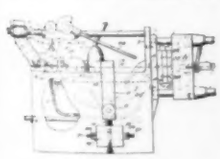
In a continuous dust arrester, the combination of a settling chamber having a dust-laden air intake, a plurality of screen chambers individually connected to said settling chamber, suction exhaust means connected to said screen chambers, continuous discharge means for said chambers adapted to prevent ingress of air therethrough into said chambers, and means for selectively shutting off the dust-laden air supply to said chambers and for rapping the screens therein to remove the accumulated dust.

1,622,433-1,622,434. March 29, 1927. **Apparatus for the Production of Metal Dust.** Robert B. Finn, San Francisco, Calif., assigner to John Finn Metal Works, San Francisco, Calif.



In an apparatus of the character described, a condenser pan, a blade movable over the bottom thereof, and means for maintaining said blade in contact with the bottom thereof.

1,622,788. March 29, 1927. **Die-Casting Apparatus.** Edward Hotter, Chicago, Ill.



In a die casting apparatus, the combination with a pot and a die having an inlet opening, of a pivotally supported container having a nozzle, and means having a cam action on the container for moving its nozzle end into and out of the inlet opening of the die and for submerging the nozzle end of the container in the molten metal in the pot for charging the container, said means automatically establishing a horizontal line lock for holding the container engaged with the die on the container reaching discharging position.

1,622,078. March 22, 1927. **Composition for Treating Metal Baths and Method of Making the Same.** Frederick M. Becket, Douglaston, N. Y., assignor to Electro Metallurgical Company, New York.

A composition for treating metal baths, comprising in coherent form a main addition agent existing in microscopic particles and a soft, relatively heavy, low-melting and relatively inert metallic binder.

1,623,222. April 5, 1927. **Abrasive Compound.** John Frederick Werder, Cleveland, Ohio.

The method of preparing an abrasive compound containing soluble starch powder which comprises mixing the dry abrasive material and dry cold water paste, saturating the dry mixture with an aqueous solution, and stirring for a time sufficient to obtain a homogeneous substance but insufficient to permit substantial solution of the cold water paste.

1,623,618. April 5, 1927. **Method of Producing Galvanized Corrugated Metal Pipe.** William J. Cook, Wheeling, W. Va., assignor to Wheeling Steel Corporation, Wheeling, W. Va.

The method of making galvanized corrugated sheet metal pipe, which consists in galvanizing the metal subsequent to the steps of corrugating the sheet and curving the same into tubular form.

1,623,948. April 5, 1927. **Nickel Alloy.** Truman S. Fuller, Schenectady, N. Y., assignor to General Electric Company, a Corporation of New York.

An alloy consisting mainly of nickel and copper and containing from about one-half to five per cent aluminum and from about 0.40 to 0.03 per cent carbon, the higher aluminum content in a given alloy being associated with the lower carbon content and vice versa.

1,624,172. April 12, 1927. **Process of Recovering Metals from Solutions.** Gaston J. Levy, Los Angeles, Calif., assignor to Hollywood Chemical Company, Los Angeles, Calif.

A process of treating waste hypo solutions containing silver, comprising adding a metal hydrosulphite to said solutions to precipitate the silver in the metallic form and separating the silver precipitate from said solution.

1,624,204. April 12, 1927. **Annealing Machine.** Thaddeus F. Baily, Alliance, Ohio.

A furnace including an elongated chamber, a plurality of feeding rolls for passing sheets continuously through the chamber, the distance between adjacent rolls being less than the diameter of each roll and electric heating means above and below the rolls for impinging heat directly upon the rolls.

1,624,217. April 12, 1927. **Electric Furnace.** Frank T. Cope, Salem, Ohio, assignor to The Electric Furnace Company, Salem, Ohio.

An electric furnace including a refractory base, a hearth spaced above said base and comprising a plurality of plates having lugs at opposite edges for engagement under the edges of adjoining plates and a resistor mounted in the space between the hearth and base.

1,624,258. April 12, 1927. **Nonoxidizing Annealing Furnace.** Victor E. Lane, Detroit, Mich.

The combination with a muffle furnace having an opening at the bottom, of a water filled pit beneath said furnace extended to provide openings thereto on opposite sides of the furnace, an elevator within said pit having a beam extending to the opposite sides thereof, a carriage mounted to travel on said beam and spaced work supports on said carriage for registering with said muffle respectively.

1,624,575. April 12, 1927. **Art of Galvanoplasty.** Arthur Biddle, Trenton, N. J., assigner to United Products Corporation of America, a Corporation of Delaware.

The method of electro-depositing material upon a non-metallic body out of an electrolyte which consists in coating said body with rubber in aqueous dispersion, surfacing said coating with an electro-conductive comminuted material, coagulating the solid content of said aqueous dispersion to form a water resistant coating, and forming an electro-deposit thereon in an electroplating bath.

EQUIPMENT

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST

SELECTIVE SPEED BUFFING AND POLISHING MACHINES

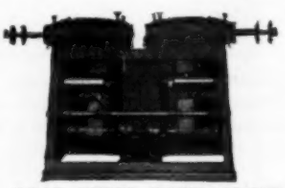
The United States Electrical Tool Company, Cincinnati, Ohio, has recently developed a selective speed polishing and buffing machine.

The most satisfactory spindle speeds universally agreed upon

FRONT VIEW SHOWING INDEPENDENT SPINDLES, SHIFT CONTROL AND BRAKE LEVERS

are between 2,250 and 2,750 r.p.m. This is the range of speeds within which the machines recently brought out are made to operate.

Any speed desired can be obtained by changing the motor pulley. Belt shift levers enable each operator to govern one spindle independently of the other—or stop it altogether.

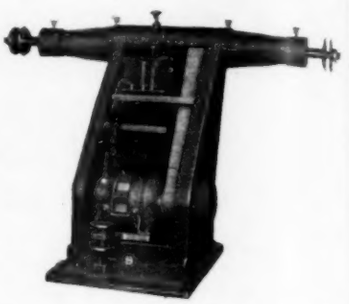


REAR VIEW—BACK COVER REMOVED

This feature also permits changing either buffing wheel when necessary without stopping production on the other, by shifting the belt from the driving pulley to the idler pulley.

Constant belt tension is automatically regulated by steel idler rollers. These do away with the necessity of intermittent adjustments to increase the tension, the common practice heretofore.

The machines are said to be extremely simple and sturdy, and with easy access to every part. These features are also included in the single spindle models.



REAR VIEW OF SINGLE SPINDLE MACHINE

The motors in all machines are located in the base—the modern practice which helps to make the machines vibrationless. The spindles are made of nickel steel, and run on heavy duty SKF ball bearings. Five sizes of these buffing and polishing machines take care of practically all requirements—3, 5, 7½, 10 and 15 h.p. motors, respectively.

NEW SIREN

The Federal Electric "Triple-A" Siren for use as a fire alarm in industrial factories, mines, and warehouses is announced by the Federal Electric Company, 8700 South State Street, Chicago, Illinois.

The Triple-A Siren is designed to serve also as a start-and-quit-work signal. It consists of three sirens mounted on a triangular base. These three sirens are connected in parallel and operate from one push button. Each siren has approximately ⅓ horse-power, totaling in all, one-horse-power. The tone of each of the three sirens is different from that of the other two.

The up-keep of the Triple-A is said to be practically negligible—less than $2.00 a year. It is extremely simple in construction and entirely enclosed. There is nothing to rust or corrode. The motor-housings, stators, and rotors are die cast from high-grade aluminum. The horns and weather housings over the motor cases are seamless deep spun. The entire unit is finished in red Duco and weights 40 pounds.

SPRAY AND FINISHING EQUIPMENT

The Willard C. Beach Air Brush Company, Harrison, N. J., is the manufacturer of pneumatic spray and finishing equipment of the "internal mixture low pressure" type. This equipment brings the liquids in contact with air pressure inside of the nozzle. The fluid and air pressure are adjusted to prevent back pressure at the nozzle or atomizing point, and they are forced through a small port or orifice in the nozzle. According to the manufacturers it is not necessary to thin down the fluid excessively or to add solvents. Moreover, it is stated that the internal mixture nozzle uses about half the usual volume and pressure of air consumed by external types and still operates at a much higher speed. Clogging and dripping are eliminated by using a wet fluid valve seat.

A fluid regulator on the back of the gun controls the flow of the material.

The angle is regulated by which the fluid and the air are brought in contact with each other and the atomizing power is broken into small jets just before it meets the fluid. In this way, it is stated, a film or coating is built containing almost the same proportions of the ingredients as originally mixed.

BEACH AIR BRUSH GUN

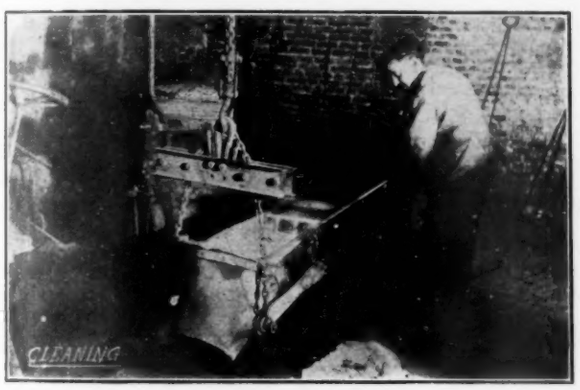
THE DURVILLE POURING PROCESS

By W. M. Corse

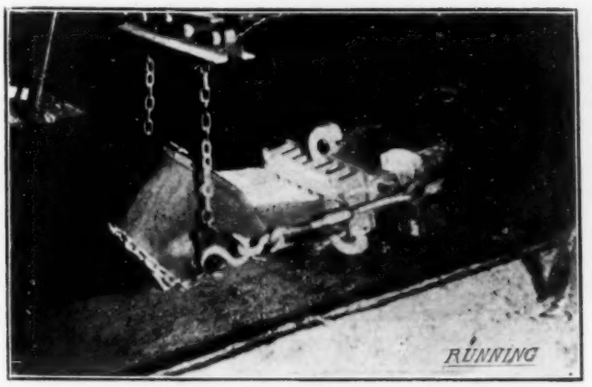
The Durville pouring process was designed primarily for use in the pouring of aluminum bronze in order to eliminate the high percentage of waste which attended the ingoting of this material,

FILLING THE LADLE

a waste which kept the alloy at so high a price that it could not be profitably introduced for general commercial use.



CLEANING THE METAL



RUNNING THE MOLD

The principle of the Durville process is to keep the upper surface of the metal horizontal at all times during the pouring operation, as this eliminates spattering and the formation—on the surface of the ingot—of oxide spots which cannot be reduced by ordinary metallurgical processess. The pouring operation itself reduces agitation of the metal, when it enters the mold, to a minimum. Experiments show that the process is of value in pouring any alloy in which agitation of the metal entering the mold is detrimental. It has been definitely proved that both zinc and copper and their alloys can be profitably handled by this process.

W. M. Corse, 810 Eighteenth street, Washington, D. C., is the representative of the owners of the process for the entire United States.

STRIPPING THE MOLD

CLOTH SCREEN DUST ARRESTER

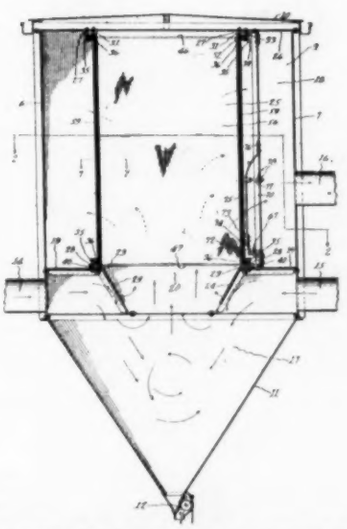
A patent has recently been granted to Northern Blower Company, Cleveland, Ohio, for an improved dust-collector of the cloth screen type.

This patent (No. 1,602,345) covers important modifications in the internal construction of these units which render them more rugged and durable in construction, and easier to maintain in efficient operation. These improvements are now incorporated in all Norblo equipment of this class.

The operation of the new Norblo units is generally similar to that of the older type. The cloth screens, stretched on wooden frames and heavily reinforced across the filtering area by steel braces and wires, are stacked closely together; and the air, after releasing the heavier suspended dust by impact upon the baffle-plates in front of the dusty air inlets, passes between the screens, through the fabric to remove the dust, and thence to the clean air chamber above.

The baffle-plates, however, now extend the entire length of the dusty air chamber instead of merely facing the inlet pipes, and they therefore act more efficiently in stopping the heavier dust from reaching the screens.

The dividing compartment which separates the clean air from the dusty air chamber has been strengthened sufficiently to permit a substantial walkway or platform on its upper surface. This greatly facilitates inspection and maintenance of the screens. The size of the removble door which gives access to the interior has also been considerably increased.



GENERAL ASSEMBLY OF NORBLO DUST COLLECTOR

Changes have also been made in the screens themselves and in the method of their assembly in position. To assure a thoroughly air-tight joint along the edge of the cloth, the wooden frame is provided with a deep groove. Into this the cloth is forced, and a superimposed layer of heavy cord and a series of nails at close intervals hold the cloth more securely in place. All air-leakage between the separate screens themselves is prevented by intervening wooden spacing strips alternately tongued and grooved, and packed with cloth on both sides. Moreover, air-vents are made on both sides of each screen instead of on one side only, thus increasing the air-volume without increasing the air-velocity.

Another interesting feature is the method of assembling the screens. These are first stacked in order along the wooden base-plates which support them at the walkway level above the hoppers. Their upper edges engage with a similar top-plate, and both upper and lower plates are provided with an angle-iron section extending from end to end of them. To compress and secure the screens in place, a wooden locking strip is next inserted in the groove of the angle-iron. Upon the sloping surface of this strip a series of coned nuts are then tightened down, and the powerful wedge action thus produced holds the entire set of screens in rigid alignment.

Some of these new screen type arresters have already been installed and are stated to be remarkably efficient and easy to maintain.

NEW SOLUTION FILTER

Fuhrman & Lundberg, 1352 South Canal Street, Chicago, Ill., are manufacturing a new and improved portable pressure filter for electroplating solutions. This filter has a capacity of 600 to 800 gallons per hour, and will handle, it is claimed, all kinds of acid solutions, such as copper and nickel. It can also handle cyanide solutions, and a combination outfit is made to handle either type.

The outfit, which is guaranteed, consists of an acid and

PORTABLE PRESSURE FILTER

cyanide proof pressure tank, filter frames covered with wool cloth for acid, or cotton for cyanides, acid proof pump connected to ½ H. P. motor, direct-driven, with hose and fittings, mounted on 4-wheel hand truck, and ready to operate from any electric light socket.

Units of different sizes are made, ranging from capacities of 400 to 1,200 gallons per hour.

CENTRIFUGAL MACHINES

The Oil & Waste Saving Machine Company, Philadelphia, Pa., manufactures centrifugal machines for removing oil from various factory wastes.

One machine is an oil and waste separator for cleaning and drying lubricating oils and has a range of capacities from 20 to 1,500 gallons per hour.

Another machine is a turbine centrifugal separator for extracting oil from metal turnings.

This machine is steam turbine driven and the heat from the steam coming into contact with the oily chips and turnings, aids the centrifugal action in producing an absolute oil extraction not produced with ordinary belt driven separators. Machines can be operated with air. All belting and countershafting troubles and cares are entirely eliminated.

The basket capacity of this machine is 8 cu. ft., making it especially adaptable for the handling of long, curly and bushy turnings.

PAINT TO SEAL JOINTS

A paint which is said to be the only material that effectively seals joints against oil leaks has been developed by the General Electric Company and is sold by the Merchandise Department at Bridgeport, Conn. The product, known as G-E No. 880 Red Protective Paint, also prevents water and gas leaks. It can be used for many purposes which require red lead or white lead, and is less expensive than either.

The paint, which is dark red in color, requires no priming and can be applied by brushing or dipping. Denatured alcohol is used as a thinner. It dries rapidly and produces a hard, smooth, glossy film which is easily cleaned and which prevents excessive collection of dirt and conducting material, thereby decreasing surface leakage and subsequent carbonization of the surface when used with electrical apparatus.

One of the first fields in which the paint has been applied is in the manufacture of fuel oil burners, in which one company is now using the material to seal all joints. Other fields in which there will be applications for the paint include plumbing, chemical plants, repair and service shops, packing houses, shipyards, etc.

HAND PUMP EXTINGUISHER

A new, 2 gallon hand pump extinguisher, made by the Pyrene Manufacturing Company, Newark, N. J., is designed especially to meet emergency conditions where it is absolutely necessary to have a fire extinguisher of this capacity for fighting such fires as electrical arcs, gasoline, kerosene, grease, varnish, etc. There is a large field for an extinguisher of this type and capacity for the protection of electrical equipment in power houses and sub-stations, on electric locomotives, electric cranes, and industrial plants, where there are large installations of electrical equipment. It is also said to be very efficient for use in extinguishing highly inflammable liquid fires of all kinds.

This extinguisher is made of two units: a powerful hand-operated, double-acting liquid pump and a container of 2 gallon liquid capacity. The pump is made of seamless drawn brass tubing of selected quality and cast brass pump head and handle. It is capable of ejecting a continuous stream from the nozzle of 3/32″ bore for approximately 40 feet.

The pump extends into the liquid container, is attached by means of a brass screw coupling and can be removed for filling or inspection of container in about two seconds—a very desirable feature. The pump may be tested for operation at any time by inserting the nozzle into the screw opening provided in the pump head, without loss of liquid. A flexible metallic hose of 24 inches in length, covered with 4-ply canvas rubber, enables the operator to direct the stream conveniently in any direction.

The container or liquid tank is made of pure copper sheet of .040″ thickness, and is strongly seamed, riveted and soldered; it is given a bright polished finish and with the brass label makes an attractive appearance. The collar and base castings are made of a special brass mixture. A hinged handle clip is provided for locking the handle, thus permitting its being used for carrying the extinguisher.

This extinguisher has been designed to stand rugged wear and special attention has been paid to making it non-corrosive and air tight to prevent evaporation of the liquid when idle.

The extinguishing liquid is non-freezing and being a non-conductor of electricity it can safely be used on electrical fires without damage to operator or equipment.

It is strongly recommended by the manufacturers that only Pyrene fire extinguishing liquid be used in this extinguisher, as water or other substitutes will injure the mechanism in a short time.

HAND PUMP EXTINGUISHER

MAINTAINING FURNACE LININGS

If refractory construction could be maintained in a condition approximating its newly-built state, it is readily apparent that lining life would be materially prolonged, and that refractory repair costs would be greatly reduced. The Botfield Refractories Company, Philadelphia, has developed a method of maintenance to make it easy to keep refractory construction in good condition through periodic and systematic maintenance.

By this new method, it is claimed, linings can be returned to good condition whenever the equipment is out of service for a short time. Sometimes, the repairs can be made without interrupting the operation of the equipment. Cracks, crevices, joints and brick pores can be filled up, quickly and efficiently. Burned-out sections and depressions can be patched. Walls can be maintained at their original thickness, with a smooth uniform surface presented to the attack of flame and other destructive elements encountered in operation.

In this method of refractory maintenance, three major elements are employed. They are the Adamant Gun, Adachrome (a chemically-neutral refractory material), and Adamant Fire Brick Cement.

The Adamant Gun is used for blowing protective coatings on brickwork in the form of pre-mixtures of Adachrome (or other refractory materials) employing Adamant Cement as a binder.

Weighing less than four pounds, the Adamant Gun requires only one man for operation. It uses air or steam at 50 lbs. pressure or more. As air is more satisfactory in results, its use is recommended wherever possible. The operator connects the air

RE-CONDITIONINC A FURNACE LINING

line to the ½-inch standard pipe thread opening on the Globe alve of the Adamant Gun, places the supply pipe in the pre-mixture, turns the Globe Valve, and the Adamant Gun sprays the pre-mixture on the structure. Thus, all brick pores, open joints, cracks and crevices are quickly filled up, the wall is given a protective coating that is said to be highly refractory and resistant to the attack of fusible coal ash, sulphur and other impurities in either coal or oil fuel which cause fluxing, slagging or melting of the brick.

HILO LACQUER

The Hilo Varnish Corporation of Brooklyn, N. Y., has taken up a new line by placing on the market Hilo lacquer.

This lacquer is put out in sixteen shades in addition to the white, black and clear. It is said to set slowly in order to permit free working and flow out, and at the same time it dries fast. Its lustre is between the egg-shell and gloss and the lacquer can be used directly over an old finish without shriveling or lifting

The Hilo Corporation is broadcasting, every Tuesday morning at 11 o'clock, New York time and 10 o'clock Chicago time, a varied program including some entertainment and short talks on home decoration, through stations in New York, Boston, Worcester, Buffalo, Chicago, Schenectady, Pittsburgh and Philadelphia.

RE-CONDITIONING SAVES BELTS

It is claimed that a considerable amount of the greasy, oil-soaked and apparently useless ends and scraps of leather belting which tend to accumulate in the odd corners of almost any plant repair department, can be utilized by the "Nu-Ply" belt reconditioning service established by The Cleveland Oak Belting Company in Cleveland, Ohio and which is to be extended by means of agencies in other principal cities as soon as circumstances permit.

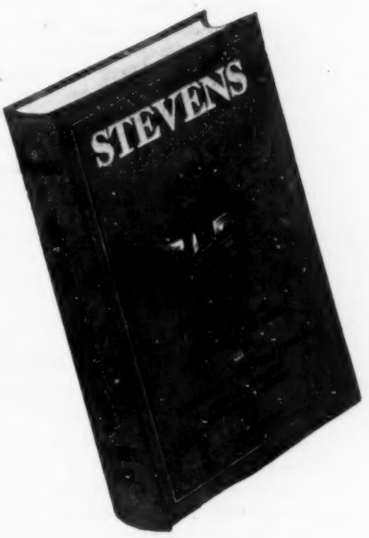
The first step of the "Nu-Ply" process is to sort out from the pieces of belting sent in, all those which are too far gone to be worth reconditioning. The plies and joints are then opened up and the cement removed. A thorough cleansing operation next removes all trace of dirt and grease from every part of the leather and opens up the pores of the material. It is now clean, but lacks the essential oil which creates the distinctive "leathery" qualities on which its future usefulness depends. These are restored by immersion and currying and the various scraps are assembled into lengths of practically new belting at, it is claimed, about one third of what new belting would cost.

NEW STEVENS CATALOG

Frederic B. Stevens, Inc., Detroit, Mich., have issued a general catalog for 1927 covering foundry facings and materials, supplies, equipment, fire-brick, buffing compositions, metal polishers' supplies and equipment, electro-plating supplies and equipment. It is cloth bound and has 842 pages, being one of the most complete ever issued in this line.

The book contains much interesting and useful data on such subjects as lumbago, soapstone, sea-coal, carbon blacking, core compounds, core oil pastes, fluxes, sands, etc.

Frederic B. Stevens, Inc., have been in business for 42 years.



EQUIPMENT AND SUPPLY CATALOGS

Hardinge Conical Rod Mill. Hardinge Company, Inc., York, Pa.

Industrial Instruments. Charles Engelhard, Inc., Newark, N. J.

Norton Grinding Wheel Stands. Norton Company, Worcester, Mass.

Sell Us Your Metal Specialties. Industrial Metal Company, Philadelphia, Pa.

The Purpose and Practice of Souring. Cowles Detergent Company, Cleveland, Ohio.

K. S. G. Process—for low temperatures. International Combustion Engineering Corporation, New York.

24-Hour Operation of Dryers. Ruggles-Coles Engineering Division of the Hardinge Company, Inc., York, Pa.

Concentrated Oxidizing Liquid for Copper, Bronze and Silver. Hanson and Van Winkle Company, Newark, N. J.

Flexible Shafting. A loose leaf catalog of engineering data. Stow Manufacturing Company, Inc., Binghamton, N. Y.

Development of Magnetic Shielding in Broadcast Radio Receivers. By Robert F. Gowen. Copper and Brass Research Association, New York.

Acid Tanks, Vats, Trays, Etc., for photoengraving, electrotyping, rotogravure and allied industries. The U. S. Stoneware Company, Akron, Ohio.

Comparative Costs of Houghton Lubricants vs. Ordinary Oils, at Philadelphia Pumping Station. A special survey made by A. C. Nielsen Company, Chicago. E. F. Houghton and Company, Philadelphia, Pa.

ASSOCIATIONS and SOCIETIES

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

AMERICAN FOUNDRYMEN'S ASSOCIATION

HEADQUARTERS, 140 S. DEARBORN STREET, CHICAGO, ILL.

The American Foundrymen's Association through its Apprentice Committee announces that the annual apprentice contest as developed at the Detroit Convention has been expanded to include both pattern making and molding contests for the 1927 Chicago Convention. The plan calls for the holding of district molding and pattern making contests for regularly indentured apprentices under 24 years of age.

The best castings and patterns of these local contests will be sent to the Convention of the American Foundrymen's Association to be held the week of June 6 at the Edgewater Beach Hotel, Chicago. From these, the three best in each class will be selected by a committee of judges and will be designated as first, second and third prize winners. In connection with the contest, apprentice training will be discussed at a special session of the Chicago meeting, the leader of the session being H. A. Frommelt, one of the foremost leaders in the apprentice training field.

These district contests are being organized by foundry associations and plants interested in apprentice training with the apprentice committee of the A. F. A. formulating a set of regulations governing these local competitions in order that uniform conditions may prevail. The A. F. A. Committee also furnishes sets of blueprints for the patterns to be used in the molding contest and drawings of the casting for which a pattern is to be made in the pattern-making contest. Copies of these regulations and blueprints may be obtained by writing to the Secretary of the American Foundrymen's Association, 140 S. Dearborn St., Chicago. The molding contests last year were won by apprentices of the General Electric Company of Erie, Pa., and the Falk and Bucyrus corporation of Milwaukee.

INSTITUTE OF METALS DIVISION

HEADQUARTERS 29 W. 39 STREET, NEW YORK, N. Y.

On April 19, 1927, a meeting was held under the auspices of the New York Section, A. I. M. E., at the Machinery Club. A 5-reel motion picture "The Story of Anaconda—From Mine to Consumer," was shown and W. H. Bassett and T. F. Brophy answered the questions of the audience. The picture showed the progress of copper from the mine to the finished product.

BRASS MANUFACTURERS ASSOCIATION

HEADQUARTERS, 35 EAST WACKER DRIVE, CHICAGO, ILL.

The National Association of Brass Manufacturers' held a very interesting and well attended meeting at the Hotel Cleveland, Cleveland, Ohio on Friday, April 15th, at which time Committee reports were received and routine business transacted.

The report of Commissioner Webster showed the Association's finances to be in good shape, also a great deal more than half of the original run of the Official Catalog, issued on January 1st, had been sold and distributed to the jobbers and manufacturers throughout the United States and Canada, thereby insuring the adoption and putting into use, the new lists embodied in this last edition, which seems to meet with general favor, and reports made by a number of the larger and more substantial brass manufacturers, indicated they are now using the new catalog lists,—a rather more favorable condition in the adoption of this new catalog than prevailed on previous issues.

Pending a merger of allied brass lines in what is expected to be a greater brass association, Commissioner Webster has agreed to remain in charge of the Association's affairs.

Some work along the line of the merger plan was gone into during the three-day session in Cleveland and then adjourned to meet again in the course of thirty days, to more clearly and definitely perfect plans of what is hoped will be a greater Brass Manufacturers' Association and that it may prove a potential factor in the plumbing brass industry of the future.

The morning session on Friday was brought to a pleasant and happy conclusion after a luncheon had been served, is presenting to Commissioner Webster, as a mark of respect and appreciation for his guidance and ability to hold the Association together for a quarter of a century, a number of serviceable and appropriate tokens to serve as a lasting memento of his quarter of a century's service in the brass industry and to serve him well in his future life of travel and study, to which he expects to devote much time in the future.

BRITISH INSTITUTE OF METALS

HEADQUARTERS, 36 S. VICTORIA ST., S. W. 1, LONDON, ENGLAND

Founded in 1908 with a membership of less than 200, the Institute of Metals expects to register its 2,000th member before celebrating its 20th anniversary next spring. The total is already over 1,800, and new members are being admitted at the rate of one a day. The next election of members is due to take place on April 13. Persons then elected, in exchange for their first subscription, will have the dual privilege of membership for the extended period ending June 30, 1928, and of receiving an extra copy of the Institute's valuable "Journal." A new booklet descriptive of the aims and objects of the Institute can be obtained from the Secretary.

TRADE ALLOYS

The Institute of Metals receives such numerous enquiries for the names of the manufacturers of the thousands of "trade alloys" that exist, that it has been decided to compile a list of "trade alloys" together with particulars of their composition and uses, as well as the names of manufacturers or agents in Great Britain. Persons interested are invited to forward to the Secretary

(1) Name of alloy.
(2) Manufacturer or agent supplying.
(3) Composition.
(4) In what form supplied.
(5) Uses.

NEW PRESIDENT

Sir John Dewrance is the president for the ensuing year. In his presidential address he referred particularly to bronze founding and enumerated some of the problems awaiting solution. He said it would help the founder very much if copper refiners could be taught to supply gas-free copper. The refiner now puts oxygen into his otherwise refined copper to prevent the discharge of occluded gas destroying the appearance of the ingots.

AMERICAN ELECTRO-PLATERS' SOCIETY

BRIDGEPORT BRANCH

HEADQUARTERS, CARE OF R. J. O'CONNOR, 1228 NOBLE AVENUE

The annual banquet of the Bridgeport Branch, A. E. S., was held at the Stratfield Hotel, Bridgeport, Conn., on April 23, 1927. The educational session was one of the best ever held in this part of the country. C. H. Proctor, founder of the A. E. S., was Chairman of this meeting. On the program were Floyd Taylor of the A. P. Munning Company, who talked on "Plating Room Control"; A. W. Graham of the Hansen Van Winkle Company, who talked on "The P. H. of Plating Solutions"; Oliver Sizelove of Newark Branch, winner of the A. E. S. Gold Medal for 1926, talked on "Nickel Plating of High Carbon Steel."

HARTFORD BRANCH

HEADQUARTERS, CARE OF TENNANT ELWIN 117 HOBART ST., MERIDEN, CONN

On Monday evening, February 28, 1927, D. J. Benoliel, Chemical Engineer of the International Chemical Company, Philadelphia, Pa., gave a talk at the Hartford-Connecticut Valley Branch of the American Electro-Platers Society.

Quite a large group turned out to hear Mr. Benoliel speak on his favorite subject "Industrial Cleaning." First the scope of industrial cleaning was outlined, then the history of industrial cleaning was stressed. This was one of the most interesting parts of the talk.

Mr. Benoliel classified cleaning materials as follows:

1. Chemicals that clean by the process of solution.
2. Chemicals that clean by chemical action.
3. Chemicals that clean by emulsifying action.
4. Chemicals that clean by mechanical action.
5. Chemicals that clean by a combination of chemical action and emulsifying action or chemical action, emulsifying action and mechanical action.

The application of industrial cleaning was thoroughly gone into with details being given on types and uses of tanks, washing machines, tumbling barrels, spray systems, etc.

The talk ended up with some frank advice on the correct way to choose a cleaning compound and the many facts which must be taken into consideration in order to choose a material that will give excellent results in the shortest time and at the lowest cost. Mr. Benoliel suggested that a qualified engineer from a dependable company that manufactures a complete line of industrial cleaning compounds, be allowed to go over the plant and prescribe in the same way that a doctor would treat a patient in the medical profession.

AMERICAN ZINC INSTITUTE

HEADQUARTERS, 27 CEDAR STREET, NEW YORK, N. Y.

The Ninth Annual Meeting of the American Zinc Institute, Incorporated, was held at the Hotel Statler, St. Louis, April 18 and 19, 1927, A. P. Cobb, President, presiding.

An innovation this year was the conducting of the two-days' meeting largely under the guidance of Chairman of the Standing and Special Committees of the Institute, among which were the following:

Statistics and Economics, William A. Ogg, Chairman.

Welfare and Safety Work, Richard V. Ageton, (representing B. F. Tillson, Chairman.)

Development of Industry, George C. Stone, Chairman.

Galvanizing, (Zincing), F. C. Wallower, Chairman.

The members in attendance were welcomed to St. Louis by Harold M. Bixby, President of the Chamber of Commerce of that City.

Among the papers and addresses were the following:

Adolph Boldt, Chamber of Commerce of the United States, **Solidarity in Industry.**

E. M. Johnson, Henryetta, Oklahoma, **Slab Zinc Production.**

C. L. Patterson, Secretary Sheet Steel Trade Extension Committee, **Outlook for Zinc-Coated Products.**

Richard V. Ageton, Miami, Oklahoma, **Selling Accident Prevention.**

Captain James A. Stader, Department of Commerce, **Research.**

Practically all of the afternoon of the second day of the meeting was devoted, as in past years, to a round table discussion conducted by Dr. Dorsey A. Lyon, Chief Metallurgist of the Bureau of Mines. Discussions covered "Leaching Zinc Ores"; "Improvements in World Zinc Metallurgy" (including domestic refractories); the annual World Zinc Survey of A. J. M. Sharpe, London, and a paper on "Fundamental Chemistry of Zinc Smelting," by C. G. Maier, Bureau of Mines.

The toastmaster at the annual dinner held on the evening of April 18, was Percy B. Butler, of Joplin, and the speaker of the evening was Dr. John L. Davis, of New York.

On the morning of the 19th eight directors were elected to fill occurring vacancies, and between the morning and afternoon sessions on the same day a meeting of the Board of Directors will be held for the election of officers, etc.

Personals

JOHN C. CAMPBELL

On April 2, 1927, John C. Campbell, President of the Newark Wire Cloth Company of Newark, N. J., completed his 50th consecutive year as manufacturer of wire cloth.

Approximately 16 of those 50 years have been with his present company and about 8 years were with his former company. The rest of the time was devoted to his trade.

Like so many other prominent industries of today, the Newark Wire Cloth Company, when organized by Mr. Campbell, was small. But he had been reared in the business as a journeyman worker under the tutelage of skilful men whose entire lives had been devoted to the trade, and in a short time he became recognized as a maker of an unusually high grade of wire cloth.

JOHN C. CAMPBELL

When his first factory was ready to operate it consisted of only 3 old-fashioned hand looms. These looms presently gave way to new and improved automatic machinery, and today it is said that the plant of the Newark Wire Cloth Company is the most modernly equipped in the industry. Their facilities enable them to manufacture with the most exacting accuracy in wire diameter, weave, and spacing, wire cloth of all sizes ranging from a 4-inch opening of heavy wire to the finest wire cloth woven. All of the fine wire used in weaving the wire cloth is drawn in their own plant.

Of course, growth through the succeeding years made necessary the construction of additions to the original plant. In 1923 their plant occupied seven buildings. During that year they purchased the Morse & Whyte Company of Cambridge, Mass., an old-established wire cloth manufacturer, and at the same time erected a large new building on Verona Avenue in Newark of sufficient floor space to house under one roof the entire equipment of the two former plants. All of this was done under the supervision of John C. Campbell.

Mr. Campbell has always taken a lively interest in politics and has done much toward bettering conditions in his own city and State.

H. W. Hardinge, president of the Hardinge Company, York, Pa., sailed April 16th for Europe. Mr. Hardinge will be absent some six or eight weeks on foreign business.

H. B. Kennedy, formerly with the A. B. Stove Company, Battle Creek, Mich., is now associated with the Ferro Enamel Supply Company, of Cleveland, Ohio.

George R. White, associated with the Manning Abrasive Company, Troy, N. Y., has left the Chicago district to make his headquarters at the company's plant, in connection with sales promotional work.

James Davies, formerly in charge of the Enameling Department of the Bishop-Babcock Company, Cleveland, Ohio, is now connected with the Ferro Enamel Supply Company, of Cleveland, Ohio.

The **Ferro Enamel Supply Company,** of Cleveland, Ohio, announces the appointment of **B. H. Hale** as Eastern District Representative, succeeding Major W. Mavor, who is now representing the company in Canada.

Harvey L. Spaunburg, superintendent of manufacture of The Root Company, Bristol, Conn., manufacturers of automatic counters, hinges, butts, stampings, bottle openers, etc., has just been elected a director of the company. Mr. Spaunburg has been connected with the Root Company since the war, having been in entire charge of the designing and manufacture of the automatic counters.

Walter Johnson is now establishing a business for himself as a service expert in the line of furnishing designs and directing the finishing of goods for the metal trade. Mr. Johnson has had charge of departments for many years in such firms as Tiffany Studios, W. H. Jackson Company, Sterling Bronze Company, and Armor Bronze Company. His headquarters are at 1010 Columbus Avenue, Westfield, N. J.

Harrison W. Wood has joined the service staff of the

Quigley Furnace Specialties Company, Inc., of New York, manufacturers of Hytempite, Quigley refractory gun, Triple-A solutions, Quigley acid proof cement, etc. He will cover the Central South and South Atlantic States. Mr. Wood has been for years identified with the manufacturing and sales departments of large industrials throughout the territory he now covers for the Quigley Company. His headquarters will be in Atlanta, Ga.

Charles F. Eldridge, formerly superintendent of the New York chromium plating plant of the Chromium Corporation of America, is now in Detroit, Mich. His new position is in the production and development department of the General Chromium Corporation, 3220 Bellevue Avenue, Detroit, which is plating automobile parts with chromium under the Duro-Chrome trademark. Mr. Eldridge is a pioneer in the development of chrome plating in the United States and was associated with Dr. Colin G. Fink at Columbia University in such early work.

Wadsworth Doster, formerly sales manager of The Torrington Manufacturing Company, Torrington, Conn., was appointed, effective April 1, 1927, assistant sales manager of Cold Strip Machinery Department, by Mackintosh-Hemphill Company, Pittsburgh, Pa., who are offering the latest developments in four-high and two-high cold mills, heavy duty reels, roll coilers, wide slitters, high-speed trimmers, straightening equipment, shears, and other auxiliaries. Mr. Doster, who was manager of the Blake & Johnson Company, Waterbury, Conn., before it was merged with the Torrington Manufacturing Company, has had seventeen years' experience in the designing and marketing of cold strip machinery.

J. T. Dalcher, formerly manager of the Machinery Production Department of the Federal Shipbuilding and Dry Dock Company of Kearney, N. J., has been appointed works manager at Newark for The Hanson & Van Winkle Company, and is now associated with this company. Mr. Dalcher has been with the Federal Shipbuilding & Dry Dock Company since 1920 in various engineering and executive position, and prior thereto from 1905 was with the Bethlehem Shipbuilding Corporation at its Fore River Works in charge of design, production, and finally as chief engineer. With The Hanson & Van Winkle Company he will be responsible for the further development and production of their well known line of mechanical and electrical machines and equipment for the electroplating and polishing industries.

Obituary

EDWARD I. BRADDOCK

Edward I. Braddock, died recently in Cleveland Heights, Ohio. Mr. Braddock was an inventor and metallurgist, and former resident of Winchester, Mass. He was prominent in machine manufacturing in New England 15 or 20 years ago, and developed processes in tinning, galvanizing and similar lines.

NEWS OF THE INDUSTRY

Industrial and Financial Events

CRAMP TO BUILD NO MORE SHIPS

The historic Philadelphia shipyard of William Cramp & Sons Ship and Engine Building Company, which has constructed some of the American Navy's proudest warships in the last century, has been forced by dwindling business to abandon shipbuilding and will convert its properties to other uses, it was announced.

Curtailment of the naval construction program and continued depression in merchant shipbuilding were blamed for the action taken, which came after J. Harry Mull, President of the corporation, had concluded an interview with Secretary of the Navy Wilbur in Washington.

The manufacturing operations of the company's important subsidiaries, the De La Vergne Machine Company, I. P. Morris Corporation, Pelton Water Wheel Company, Federal Steel Foundry Company, Cramp's Brass and Iron Foundry and Cramp Engine Manufacturing Company, will be continued. These operations include the manufacture of Diesel engines, castings and hydraulic and other machinery. The business of the subsidiary companies is in a sound and prosperous condition and is capable of considerable expansion. A portion of the shipyard properties will be utilized in the operations of the subsidiary companies, and it is understood that other plans are in contemplation for the balance of the shipyard and its facilities.

BALBACH LEASES PLANT

Balbach Smelting & Refining Company has leased its plant at Newark to the American Metal Company for a period of five years beginning May 1, 1927. Balbach Metals Corporation will continue to act as purchasing and selling company with offices at 61 Broadway.

SILVER PRODUCTION MAINTAINED

Silver production in the United States in March amounted to 5,131,000 ounces, the American Bureau of Metal Statistics reports, against 4,979,000 ounces in February and 5,196,000 ounces in January, 1927. In 1926 the average was 5,076,000 ounces monthly. Canadian production of silver was 1,503,000 ounces in March, against 1,733,000 ounces in February and 1,459,000 ounces in January. The average there last year was 1,771,000 ounces.

LEAD IN 1926

Refined primary lead produced in the United States in 1926, from domestic ore, amounted to 680,685 short tons, valued at $108,910,000, as shown by reports made by producers to the United States Bureau of Mines, Department of Commerce. The production was 4 per cent greater than in 1925; the value was 4 per cent less, due to a decrease in the average selling value of lead from 8.7 cents a pound in 1925 to 8.0 cents in 1926.

Refined lead produced from foreign ore, principally from Mexico, amounted to 118,256 short tons—an increase of 5½ per cent over the production in 1925.

The apparent consumption of refined primary lead in the United States in 1926 amounted to about 736,000 short tons, as compared with a consumption of about 656,000 tons in 1925.

MAGNESIUM IN 1926

Sales of magnesium produced in the United States in 1926 amounted to 322,650 pounds, valued at $390,400, as compared with sales of 245,000 pounds, valued at $274,400 in 1925, according to James M. Hill, of the United States Bureau of Mines, Department of Commerce.

Over 73 per cent of the magnesium was sold in ingot form at prices ranging from 69 cents to 98 cents a pound, and such sales increased nearly 19 per cent as compared with 1925. Sales of castings in 1926 were 36,940 pounds and were over 11 times greater than in 1925. Sales of wire and tubing increased fourfold as compared with 1925, but sales of sheet were nearly 9,000 pounds less than those in the previous year. The average price of domestic ingot metal in 1926 was 80 cents a pound, that of powder $1.64 a pound, and of castings $2.57 a pound.

Imports of magnesium metal in 1926 were 10,117 pounds, valued at $4,660, as compared with 8,326 pounds, valued at $7,070, in 1925.

METALS AND ALLOYS

1,140 establishments reported to the Census Bureau in this classification, not including aluminum, gold, and silver products, in 1925, a total production valued at $593,555,540, an increase of 3.7 per cent as compared with the last preceding census year. This industry includes in the main the manufacture of non-ferrous alloys except aluminum, gold and silver alloys, from virgin metals produced by smelters and refiners, and the further manufacture of such metals and alloys into specific products. It does not includes the smelting and refining of non-ferrous metals from the ore or the smelting and refining of scrap metals. The cost of materials including fuel and electric power in 1925 was $402,763,079, an increase of 5.5 per cent as compared with the cost of materials in 1923. The amount of horse-power used in 1925 increased 17.5 per cent over that used in 1923.

SLAB AND ROLLED ZINC IN 1926

SLAB ZINC

The production of slab zinc reduction plants in the United States in 1926 amounted to 659,221 short tons, valued at $98,883,000, according to statistics compiled by the United States Bureau of Mines, Department of Commerce. This production consisted of 611,991 tons of primary metal made from domestic ore; 6,431 tons of primary metal made from Mexican ore; and 40,799 tons of redistilled secondary metal. The production in 1926 exceeded the production in 1925 by 47,094 tons, or 8 per cent.

The apparent consumption of primary zinc in the United States in 1926 amounted to 557,025 tons, an increase of nearly 57,000 tons over the apparent consumption in 1925.

ROLLED ZINC

Rolled zinc produced in the United States in 1926 amounted to 172,668,298 pounds, valued at $17,880,901. These figures, which were compiled from reports made by producers to the Bureau of Mines, show a gain of 21 per cent in quantity and 23 per cent in value of output, as compared with 1925. The greatest increase was made in strip and ribbon zinc. Total exports of rolled zinc increased 11 per cent.

The average selling value of rolled zinc was 10.4 cents a pound in 1926, compared with an average selling value of 10.2 cents in 1925. Market quotations on sheet zinc, f. o. b. mill, ranged from 11.25 cents to 12 cents a pound during the year; at the end of the year the quotation was 11.50 cents.

POOR METAL WRECKED SHENANDOAH

Defects in the metal work of the Shenandoah were the real cause of the destruction of the dirigible near Zanesville, Ohio, on Sept. 3, 1925, according to Professor George L. Clark, Director of the Research Laboratory of Applied Chemistry of the Massachusetts Institute of Technology, in an exclusive interview with The New Haven, Conn., Register, February 16, 1927.

For many months Professor Clark has been making minute studies of metal sections of the giant dirigible in the X-ray laboratories of the university, and these have led him to the conclusion that defects in the metal rather than the fury of the storm through which the Shenandoah was riding, caused the tragedy.

"The results of our study do not place the responsibility for the crash upon the manufacturers of the metal or the dirigible. It was merely a case of inadequate knowledge. When the ship was built we did not know so much about X-ray examination of metals, and there was no way of discovering hidden defects in the framework."

METAL SPOOLS AND REELS

Upon the request of the Simplified Practice Committee of the Manufacturers of Metal Spools and Reels the National Committee on Metals Utilization convened a conference of manufacturers, distributors and users at the Department of Commerce, on March 31, 1927, for the purpose of developing a Simplified Practice Recommendation for stock sizes and dimensions of metal spools and reels. The Simplified Practice Committee of the Industry, composed of manufacturers of metal spools and reels, which was appointed at a preliminary conference held December 2, 1926, made a survey of current practice in their industry. The results of this survey were used as a basis for an agenda which was presented to the conference in the form of a tentative recommendation.

The chairman of the meeting was authorized to appoint as soon as possible a Standing Committee, to include representatives of the manufacturers of wire and wire machinery, those engaged in insulating wire; manufacturers, distributors and users of metal spools and reels; also manufacturers and users of wood and metal take-off reels, as well as all wood and composite spools. The further suggestion was made that the Standing Committee have its first meeting within 3 months from the date of this meeting, to give consideration to the problems which were referred to this Committee by the conference.

The Simplified Practice Recommendation covering the six standard unit weights, is effective January 1, 1928, for new production.

Those in attendance at the conference of March 30, were representatives of the large metal fabricating companies.

ALUMINUM IN SPEED BOAT

A new "commuting cruiser," build by the Maybach-Zeppelin Company for Otto H. Kahn, a New York banker, has some unusual features of construction.

The conventional wooden ribs of a ship have been placed at an angle to give greater longitudinal strength, as experience in bliuding Zeppelin airships has suggested. A duralumin steel framework to be made by the Zeppelin Airship Company will re-enforce the hull from stem to stern, made somewhat like the backbone of a fish, and the engines are suspended on this frame, thus doing away with vibration. The water and gasoline tanks are made of aluminum, and are of the same type as those used on the dirigible "Los Angeles."

NEW AIRPLANE METAL

British aeronatuical engineers are greatly interested in the new airplane created by Soviet engineers. It appears that the machine is constructed of a new aluminum alloy, which has been produced as the result of four years of research in the Soviet Technical Institute. This material, known as Keltchoug aluminum, is reported to be a considerable improvement on duraluminum, which at present is used in airplane and airship construction. Even the wings and fuselage are covered with corrugated sheets of the new metal.

METAL INSTALLATIONS

According to the Chase Diamond, the Graybar Building in New York has used Alpha brass pipe throughout the entire water system.

The town of Copperton, Utah, a suburb of Bingham, a large mining camp, is using only copper and brass for shingles, roofs, gutters and downspouts in its houses.

C. F. Arendholz has built a boat in which no other metals but brass and bronze are used. In this respect the vessel is similar to the "Carnegie" which was used for polar exploration and for that reason had to be non-magnetic.

GOLD ROBBERY

Early April 9, 1927 the vaults of the Illinois Watch Case Company, in Elgin, Ill., were cut through with acetylene torches by a band of at least fifteen who overpowered three watchmen, an engineer and a fireman, worked for three hours and saw to it that the hourly reports of the watchmen were made to a protective company. No trace has yet been found of the robbers.

GOLD STORED IN NEW YORK

Manhattan Island, New York City, has a single cache of 4,000 tons of gold. This store of precious metal, many times greater than any that ever collected elsewhere in the world, lies in the vaults of a little square building in Wall Street, No. 32. It is the New York Assay Office, a branch of the Treasury Department in Washington.

PLATINUM IN AFRICA

According to newspaper reports, in the Transvaal, in South Africa, platinum has been discovered in unlimited quantities, and the government engineers think that, as a source of wealth, the deposits are comparable to the famous gold reefs of the Rand.

LONG DISTANCE TELEPHONING

Evidence that business men are using long distance telephone lines more freely than ever is contained in a statement just issued by the American Telephone and Telegraph Company. The calls in 1927 show an increase of 11% over the same months of 1926.

Business Reports of the Metal Industry Correspondents

NEW ENGLAND STATES

WATERBURY, CONN.

MAY 2, 1927.

A general surplus of labor exists here according to the monthly report on the Federal Department of Labor, which also states: "Some plants are running part time and others are operating on full time but with reduced working quotas." Building is fairly active but the local supply of craftsmen is more than adequate for the demand. The same report, however, states as to the State as a whole that "metal working plants are operating at a high level."

Local factory heads, however, deny that the unemployment situation here is serious or even unsatisfactory. The three leading concerns report that their plants are doing a normal business with no curtailment in employment. Some departments, however, are working but five days a week. The Chamber of Commerce figures show that the March employment in the eight largest plants exceeded that of February by about 200 but that the February figures were 200 less than January, which in turn was 100 less than December. This is nothing unusual for this time of year. The **American Brass Company** states that there has been no let-up in business or curtailment of employment for the past few months and that a fair amount of business is being done. **The Chase Companies** say that conditions with them are good with no slackness in business or employment except in two departments.

E. O. Goss, president of the **Scovill Manufacturing Company,** submitted the report of the power committee at the quarterly meeting of the New England Council at Boston last month. He suggested a joint conference between representatives of the power companies and the farmers concerning the extension of power in rural areas and that an inquiry be made as to what power companies are doing in this section and elsewhere to promote the development of industry in their areas.

Judgment for $12,777 was awarded the **Waterbury Button Company** in the superior court here last month against the **Zooloid Products Company.** The claim was made that the latter company guaranteed to furnish buttons of high grade to the local concern, each to share half the cost of the new dies. The local concern claimed the buttons when delivered fell short of specifications and suit was brought for breach of contract. The local concern paid $6,825, it was charged, as its share for the dies.

"A Study of All American Markets," received by the local library, classes Waterbury as manufacturing 60 per cent of the nation's brass and containing one concern whose mills are the largest of any brass making company in the world.

Most of the leading manufacturers are named on the executive committee for the drive for $700,000 for the **Waterbury Hospital** just launched.

The inventory of the estate of the late **Charles L. Holmes,** local banker, just filed, shows among others the following local stocks held by him: 400 shares **Waterbury Clock Company,** $126,000; 500 shares **Scovill Manufacturing Company,** $121,250; 37 shares **Anaconda Copper Mining Company,** $1,743; **Farrel Foundry,** 250 shares, $37,500.

Irving H. Chase, president of the **Waterbury Clock Company,** has been named as the chairman of the local committee to handle the local drive for Yale's $20,000,000 fund.

W. E. Fulton, former president of the **Waterbury Farrel Foundry,** has made another gift of $5,000 for the development of Fulton Park. Besides giving the park itself, he has donated several hundred thousand dollars for its development.

F. S. Chase, president of the **Chase Companies,** who left over a month ago to visit his son, A. S. Chase, vice-consul in Peking, China, has sent word that he met his son in Japan and both are now traveling from there to Peking in spite of the present outlook that the trouble in China may reach to the latter city.

J. Stanton, general sales manager of the **Baltimore Copper Smelting & Rolling Company,** will tell the story of copper from the mine to the consumer, illustrated with moving pictures, at this month's meeting of the **Chase Foremen's Association.**—W. R. B.

BRIDGEPORT, CONN.

MAY 2, 1927.

Assessed valuations of the **Bridgeport Brass Company** on four grand lists have been reduced a total of $4,281,305 by settlement of appeals to the Superior Court. Approximately $200,000 was paid to the city last month in full settlement of the account, it is understood. The question of the company's assessments on the grand lists of 1922, 1923, 1924 and 1925 has been in the courts for some time. The $200,000 in taxes paid is said to represent the difference between the taxes already paid by the company and the compromise value now arrived at by settlement of the appeals.

Nearly 100 members of the Fairfield County Fish and Game Association were guests of the **Remington Arms Company** at their meeting last month and inspected the entire plant. **Col. L. J. Herrman,** works manager, welcomed them and assigned guides to conduct them through each department.

A motion requesting that a receiver be named and the affairs of the **Monumental Bronze Company** be wound up was filed in the superior court last month by counsel for the Bridgeport Trust Co. and other creditors who own a large majority of the stock. It has an authorized capital of $49,500 and with the exception of one $2 dividend has paid no dividends since 1921.

Jenkins Brothers, who bought the local plant of the **Crane Company** some years ago, have taken to the General Assembly of the State, now in session, its plea for abatement of about $30,000 in taxes which it alleges were unjustly levied by the city right after the acquisition of the local property. Through an error by its accountant, it claims the tax list as made out the first year included the intangibles as well as the tangible real estate.

The Federal Department of Labor states of Bridgeport: "All plants are running and there is very little unemployment evident. Building is fairly active and craftsmen are well engaged."—W. R. B.

CONNECTICUT NOTES

MAY 2, 1927.

TORRINGTON. Mrs. Lillora R. C. Hungerford, widow of the late **Uri T. Hungerford,** distributor of copper and brass products, died April 14 at Briarcliff, N. Y. The funeral was held here April 16. Both were former Torrington residents. Mr. Hungerford, who died only a few months ago, had donated the Charlotte Hungerford hospital here, and in his will left $500,000 outright to it, leasing the residue of his estate, after certain bequests, to his wife, but with the proviso that his wife's share should go to his wife on his death. His estate amounted to over $5,000,000.

The Federal Department of Labor reports all plants in Torrington to be running on full time and little unemployment.

John **Brown** of the **Union Hardware Company,** has been named chairman of the Industrial Recreation Council. Other factories represented on the council are: the American Brass Company, Hendey Machine Company, Torrington Company, Fitzgerald Manufacturing Company, Torrington Manufacturing Company, Hotchkiss Brothers Company, and Progressive Manufacturing Company.

HARTFORD. Holders of preferred and common stock of the **Billings & Spencer Company,** April 19th, elected protective committees to represent them in conferences with similar committees of the noteholders and bondholders, leading to a reorganization of the company and a strengthening of its capital structure. It was announced that the holders of notes amounting to $750,000 were demanding at least partial payment. **L. F. Robinson,** counsel for the company, said that if some agreement could be made between the respective groups to meet some of the indebtedness, the path towards reorganization could be cleared. The preferred stockholders' committee elected at the meeting consists of William H. Putnam, William S. Conning, **William L. Mooney,** George S. Stevenson and Richard L. Goodman. The common stockholders' committee consists of Lucius B. Barbour, Austin Dunham, Nelson Smith and Frederick C. Billings.

NAUGATUCK. Three large buildings, composing most of the plant of the **Naugatuck Chemical Company,** were destroyed by fire of an undetermined origin, April 12. The loss is estimated at several hundred thousand dollars. A series of small explosions followed the outbreak of the fire and resulted in spreading it.

DERBY, ANSONIA, SEYMOUR AND SHELTON. The Federal Department of Labor reports than an improvement, although slight, was noted in industrial employment during the past month. While some plants continue on part time, others have resumed full time operations or increased their working quotas.

DANIELSON. Control of the **Williamsville Buff Manufacturing Company** of this place has been taken over by **W. Irving Bullard,** Boston banker and textile manufacturer, who has many holdings in this section. The company manufactures buffs used in the metal trade.—W. R. B.

PROVIDENCE, R. I.

MAY 2, 1927.

Although there is a general improvement reported in practically all lines of the metal trades, those connected with the building industries are perhaps the most affected. The various branches of the manufacturing jewelry industry are showing indications of betterment in conditions which is especially encouraging. These activities are reflected in the greater demand for small tools and machinery.

The **Rhode Island Metal Findings Company,** of Providence, has been incorporated under the laws of Rhode Island with an authorized capital stock or $5,000 consisting of 50 shares of common stock at $100 each. The incorporators are Roger L. McCarthy, Edmund J. Kelly and Joshua Bell.

The **D. Evans Co., Inc.,** of North Attleboro, of which **Clyde Barnhill** is the head, one of the oldest button manufacturing concerns in the country, has received the contract for all the buttons to be used on the uniforms to be worn by the attaches of the new Roxy Theatre, which will be opened in New York city at an early date.

Samuel M. Nicholson was re-elected president and general manager of the **Nicholson File Company,** at the annual meeting of the directors, which followed the meeting of the stockholders held last month at the offices of the concern, 23 Acorn street, Providence. Other officers elected consisted of the following: Vice-President and Treasurer, Paul C. Nicholson; Assistant General Manager and Secretary, Ernest S. Craig; Assistant Treasurer and Cashier, Henry W. Harman; Assistant Treasurer, Albert J. Dana; Assistant Secretary and Manager of Credits, S. Foster Hunt; Assistant to President, Robert W. Hathaway; Directors: Samuel M. Nicholson, Paul C. Nicholson, Marsden J. Perry, John R. Gladding, Byron S. Watson, Ernest S. Craig and Augustus S. Saunders.

Dannin & Smith, of Newport, purchased the greater part of the machinery, fixtures and other property of the foundry and machine shop of **Kilburn & Lincoln** in Fall River, which was recently dismantled.

Dudley Hardware Company, 49 Exchange Place, Providence, has the contract for all the hardware and furnishings for the College of Education building being erected by the State of Rhode Island in Providence.

J. L. Anthony & Company, 115 Baker street, Providence, manufacturers of fancy wires, plated stock, etc., have been appointed special agents for the **Hoyt Metal Company,** of St. Louis, Mo., and will become the New England distributers for that concern's extensive line of metal products.

Henry B. Wright has taken over factory space adjoining his plant at 53 Sabin street, Providence, which will practically double his capacity for the refining of jewelers' waste materials. He is fitting up the additional space with new furnaces, sifters, grinders and all other paraphernalia essential for making prompt and efficient returns to the trade. The additional factory space also allows for the establishing of a laboratory and separate assay department and also for the enlarging of the present office capacity.—W. H. M.

MIDDLE ATLANTIC STATES

NEWARK, N. J.

MAY 2, 1927.

Disavowing "each and every charge" of bias and prejudice alleged against him in an affidavit by a former president of the **Noxon Chemical Products Company,** Federal Judge William N. Runyon withdrew as presiding judge in the receivership suit of that firm. He reserved the right, however, to dispose of matters argued before him and now awaiting decision. The affidavit was filed at Trenton by Ralph Carey, Jr., in behalf of Ralph Nottebaum, and was based on the denial of a petition for the dismissal of Charles R. Leckie and Archie Ormand, on allegations of fraud and neglect. The withdrawal of Judge Runyon placed the case in the hands of Judge Joseph Buffington, of Philadelphia, senior Federal Judge of this circuit. He will designate another jurist to preside.

The **Berger Manufacturing Company,** of Canton, Ohio, has leased the main floor of the new building at 58-60 Earl Street. The Berger Company manufactures metal filing cabinets, ceilings and other products. **Morris, Miller and Mulheron, Inc.,** have been chartered with $100,000 capital and will open a plant for the manufacture of jewelry.

Other concerns chartered here were: **E. Lutz Company,** plumbing supplies, $10,000; **Greylock Hardware Company,** hardware, $50,000.—C. A. L.

TRENTON, N. J.

MAY 2, 1927.

Trenton metal industries are not facing any prosperity at the present time, although business has picked up somewhat at some of the factories. The **Jordan L. Mott Company** continues to operate five days a week, making a total of but 38 hours a week. The **John A. Roebling's Sons Company** is not running to capacity in the copper and brass departments.

Charles E. Mace, traffic manager of the Trenton Chamber of Commerce, has submitted to the Interstate Commerce Commission in Washington, D. C., arguments on rates on brass articles from Waterbury, Conn., to Trenton. The present rate in carloads is 31 cents and in less than carloads 47½ cents. Rates of 27 cents for carloads and 40 cents for less than carloads are being sought. It is pointed out that the effort is to make the rates comparable with other brass-producing points in Connecticut to points in the Trenton territory.

Burton R. Hawke and **George Fullerton,** trading as **Headquarters Welding Company,** Camden, N. J., have field a voluntary petition in bankruptcy in the United States District Court

here. The firm lists its liabilities at $3,804.16 and its assets at $1,457.50. The matter was referred to referee, Thomas L. Gaskill.

After **Frank K. Thropp,** of Trenton, and **William Malcom** and **William Voltz,** of Philadelphia, the three directors of the **Clay Products Company of America,** had failed in a friendly suit to conserve the company's assets of nearly $1,000,000, Federal Judge Thompson appointed equity receivers for the combine. Liabilities were placed at $978,100 and assets "at least that much." Under the court's decree, the receivers, John C. Gilpin, Randolph W. Childs and Mr. Malcom, were authorized to continue the business until further notice. The receivers announced that they planned to reopen the plant and would make an effort to effect a reorganization. Failing in this, they said, the assets would be liquidated as soon as possible.

Flames recently destroyed the big plant of the **B. F. Sturtevant Company,** manufacturers of sheet metal products at Camden, N. J. The loss is estimated to be about $200,000. The fire burned for some time and resulted in many firemen being injured. The origin of the blaze is unknown. The plant will be rebuilt.—C. A. L.

MIDDLE WESTERN STATES

DETROIT, MICH.

MAY 2, 1927.

The **Lake Huron Brass Company,** at Port Huron, Mich., has increased its capital stock from $10,000 to 10,000 shares non-par value, to 200,000 shares non-par value and $500,000.

The **Blakeslee Forging Company** of Plantsville, Conn., makers of brass drop forgings, has appointed William R. Anderson district sales manager for Michigan, with offices at 4611 Woodward avenue, Detroit. Mr. Anderson formerly was general manager of the Anderson Forge and Machine Company, until its absorption by the Hudson Motor Car Company.

Fire on April 10 caused damage estimated at $200,000 to buildings occupied by the McCord Radiator Company, at Detroit.

Owners of the **Grand Haven Brass Foundry,** at Grand Haven, Mich., announce the purchase of control of the **Bolling Manufacturing Company,** of Grand Haven, and also of the **Cochral Brothers' Brass Foundry,** of Washington, N. J. The latter plant will care for the company's rapidly growing eastern business. Plans for enlarging the two plants are underway, it is stated, and the payroll largely increased.

The Saginaw Mich., foundry of the **General Motors Corporation,** poured on an average of 645 tons of metal a day during February. A record breaking total was poured in one day, when 730 tons were handled.

The **South Park Welding Works** has recently been incorporated at Port Huron, Mich., with a capital stock of $10,000. It will engage in a general metal welding business.

The **Swift Electric Welder Company,** Detroit, has increased its capital stock from 25,000 non-par value to 50,000 non-par value.

The **Campbell, Wyant & Cannon Foundry Company** has recently increased its capital stock from $2,000,000 to $3,500,000. The additional capital, it is understood, will be used for expansion purposes.

David H. Barnett, organizer and secretary of the **American Brass & Iron Company,** at Detroit, has been elected to the directorate of the Commonwealth Federal Savings Bank, also of Detroit.

An indication of the prosperity of Port Huron, Mich., is reflected in the ready absorption in about 12 hours of the issue of $1,100,000 of first mortgage six per cent serial gold bonds of the **Mueller Brass Company.** The issue, which was underwritten by the Illinois Merchants Trust Company, Chicago, was considerably over subscribed, it is stated. The bond issue was approved by the Michigan Securities Commission. The Mueller Brass Company, the controlling interest in which was recently acquired by **Oscar B. Mueller,** president, is one of the leading concerns of the kind in the middle west.

The **Dertoit Brass & Malleable Works** has recently increased its capital stock from $1,500,000 to $1,650,000. It is understood the additional capital will be used for expansion purposes.

Merger of the **C. M. Hall Lamp Company,** with the **Edmund & Jones Corporation** and its subsidiaries at Detroit makes the combined organization the largest individual producer of automobile lamps in the world. It supplies the motor car industry with 25 per cent of its requirements. The merger resulted in the sale of the Hall Lamp Company plant and property at Kenosha, Wis., the disposal of the surplus machinery and the removal of the remainder to its Detroit plants. The **Chicago Electric Manufacturing Company** and the **Canadian Lamp & Stamping Company,** former subsidiaries of the **Edmund & Jones Corporation,** also were sold. Even after disposing of three subsidiary plants, the plant capacity of the company has been increased about 150 per cent, and by centralizing in Detroit of all manufacturing activities, large economies have been effected and manufacturing costs lowered. All administrative work is now being handled by the former Hall Lamp organization, the saving in executive salaries alone being over $100,000 annually.

Barnes, Gibson, Raymond, Inc., Detroit spring manufacturers, recently added several new buildings and increased equipment to its plant on Miller road, trebbling production capacity, according to **Lyman Adams,** general manager. The company has installed a fully equipped metallurgical and heat-treating laboratory, with **F. P. Zimmerli,** former metallurgical engineer in charge of heat-treating at the Rickenbacker motor plant, as chief.

The Macklin Company has been incorporated at Jackson, Mich., for the purpose of manufacturing abrasive products. It has a capital stock of $250,000.—F. J. H.

MILWAUKEE, WIS.

MAY 2, 1927.

The **Velguth Metal Parts, Inc.,** 420 Fourth street, Milwaukee, was recently incorporated for $50,000. The incorporators of the company, which is engaged in the manufacture of tools and machinery, are Carl Velguth, B. G. Velguth and Leo Slensby.

The **Hy. Schiffman Company,** 230 Muskego avenue, which deals in the smelting and refining of metals, has been incorporated for $20,000. Hy. Schiffman and Louis Schiffman are the incorporators.

The **Spring City Pattern Works, Inc.,** Waukesha, has been incorporated for $50,000. The incorporators of the concern, which manufactures wood and metal patters, dies, stamps and tools, are Henry B. Mueller, Walter E. Scheel and Harry Arneson.

The **Wisconsin Iron & Metal Company,** Oskosh, Wis., heaviest loser in the $150,000 fire which completely razed buildings of three local industries early in April, has already completed tentative plans for rebuilding, according to an announcement made recently by Isadore M. Block, secretary-treasurer of the concern.

Origin of the blaze which destroyed the building could not be determined. In addition to the Wisconsin Iron & Metal Company the fire damaged the buildings of the **Hudson Manufacturing Company** and the **General Foundry Company.** The barn, garage, office and stockroom of the Iron & Metal Co., was destroyed.—A.P.N.

CHICAGO, ILL.

MAY 2, 1927.

The **United American Metals Corporation of Illinois,** 451 No. Oakley Blvd., was recently incorporated with a capital of $5,000 and 1,000 shares, no par value. The concern will engage in the manufacture and smelting and refining of all metals except iron and steel. Incorporators are: Theodore Richter, A. S. Hall, L. W. Goldberg.

Benjamin Golitz & Company, 134 North La Salle street, were recently incorporated with a capital of $100,000. The company will deal in and handle iron and steel scrap of other metals. The incorporators are: L. S. Abelson, Maurice Turner, L. R. Siegel.—A.P.N.

OTHER COUNTRIES

BIRMINGHAM, ENGLAND

APRIL 18, 1927.

Business in the metal trades is rather dull and this department is feeling the effect of the depression prevailing in iron and steel. The first quarter has been a disappointing one, especially for jewelers and silversmiths who are experiencing a very quiet time. Brass and copper tube makers have a moderate amount of orders and are hopeful that the Admiralty will give out some contracts later in the year. With the approach of the building season makers of ornamental brass anticipate a good demand in connection with house building. A good deal of metal is now used in the equipment of shop fronts and many large stores have undertaken extensive alterations during the last few weeks. Shipbuilding is also showing signs of revival and a large business is done in Birmingham in the supply of electro-plate and cutlery.

At the annual meeting of the **British Aluminium Company, Limited** the Chairman (Major R. W. Cooper) stated that the profit for the year was £438,776 as against £550,434. In spite of the enormous difficulties of last year with regard to fuel, output had been satisfactory and they had been able to deliver a tonnage which constituted a sales record. Satisfactory developments were taking place in the demand for their products. One instance was the use of aluminium for electrical conductors, with the result that the electric industry was becoming one of the more important outlets for their metal.

The work of the **British Non-Ferrous Metals Research Association** which has its headquarters at Birmingham is being shown by a series of exhibits at the Science Museum, South Kensington, London. The service which scientific research can render to the non-ferrous industry is receiving wider recognition every year, and the new movement is effecting a change of outlook among many of those engaged in the non-ferrous trades which have their principal center in Birmingham. Last year over £25,000 was expended on the work, the scope of which is being steadily enlarged with the active co-operation of the industry and the support of the Department of Scientific and Industrial Research. The exhibition in London illustrates the plan and progress of about half the researches which the Association has in hand. What is being done to fathom the mysteries of the atmospheric corrosion and tarnishing of metals, and to discover the appropriate antidote, may be seen in one exhibit. Other researches include soundness of castings, "wiped" plumbers' joints, the improvement of the surface quality of sheet brass, and the spectroscopic assay of zinc and die castings in aluminum alloys and in brass and bronze afford evidence of the thoroughness of the work being undertaken.

The advantages of chromium plating are receiving a good deal of attention in Birmingham circles lately. Manufacturers are applying it in motor-car fittings and accessories, cooking utensils, bathroom fittings, laboratory apparatus, and various descriptions of brassworks. At the Birmingham University it has been tried out on laboratory water taps and has been proved successful in withstanding the acids which usually attack ordinary metal surfaces. Motor car and omnibus builders are also being equipped with chromium-plated fittings. It is claimed that metal which is efficiently plated is proof against the corrosive effects of salt water. A leading manufacturer points out, however, the necessity for a complete protection of the underlying basis metal by a deposit of chromium of sufficient thickness to prevent the action of the atmosphere on the underlying brass, nickel-silver or whatever metal the article is made of.

The President of the Birmingham Jewelers' Association in his review of the past year mentioned that a Bill was being promoted by the London Chamber of Commerce to standardize platinum at not less than .950, including solder, to which the Association had signified approval subject to the modification of one clause. Members of the manufacturing goldsmiths' section had also been circularized on the question of the formation of a platinum research sub-section for investigating the best alloys for various purposes, the quality of platinum supplied to the trade, and the quality of finished articles turned out by the trade. As to the desirability of a standard of electro-plate deposit for the protection of traders the president said it seemed that the technical difficulties were such that at the moment no recommendation could be made, but any suggestions would be sympathetically considered.

Recent business includes significant developments. One firm has just completed an order for the supply of the requisite brass tubes for domestic water conveyance for 1,000 houses. A number of orders have been placed for non-ferrous tubes for warships, one concern having just completed 40 tons for H. M. S. Sussex. Big consignments of bedstead tubes have been sent to South America for making up at the port of destination, one of these contracts representing 1,000 tons. —J.H.

Business Items—Verified

Western Clock Company, Lt., Peterborough, Ont., Canada, is having plans prepared for an addition to their plant.

The **Ajax Metal Company,** of Philadelphia, Pa., has purchased the Foley Furnace Company, which owns a number of electric furnace patents.

Hygrade Polishing and Plating Company announce that they are in full operation at their new quarters at 409-413 East 91st Street, New York.

Armstrong Cork Company, Beaver Falls, Pa., has erected a one-story, 180 x 220 and 60 x 120 ft. warehouse and kiln building, at a cost of $80,000.

The **Brown Instrument Company** has recently opened a Cincinnati Branch at 718 First National Bank Building, with J. R. Green as district manager.

Atlantic Enamel and Lacquer Works, Inc., have removed their office from 75 West Street, New York City, to their factory at 691 Main Street, Belleville, N. J.

The **Ferro Enamel Supply Company,** of Cleveland, Ohio, has closed its Cleveland warehouse at 422 Frankfort Street, Cleveland, and is making a large addition to its plant in Clinton, Mich.

The **Anderson Chemical Company,** Division of the Merrimac Chemical Company, Boston, Mass., manufacturer of lacquers, announce the removal of their New York office to 7-11 East 44th Street.

The Philadelphia district offices of **Combustion Engineering Corporation, Heine Boiler Company,** and **Ladd Water Tube Boiler Company,** have been consolidated at 807 Bankers Trust Building, Philadelphia, Pa.

The **Ferbert-Schondorfer Company,** 12700 Elmwood Avenue, Cleveland, Ohio, manufacturer of paints and varnishes, awarded contract for the construction of a two-story 56 x 65 ft. factory. Estimated cost, $50,000.

The **Audit Bureau of Circulation,** of which The Metal Industry is a member, has removed its headquarters from the Century Building to the Builders' Building, Wacker Drive and La Salle Street, Chicago, Ill.

The **American Brass Company** has opened an office in the Military Park Building, Newark, N. J. J. B. Benedict and L. B. Smith are in charge and will handle the complete line of Anaconda copper, brass and bronze products.

Federal-Mogul Corporation, 11031 Shoemaker Street, Detroit, Mich., is preparing plans for a two-story addition to its plant, to cost in excess of $50,000. This firm operates the following departments: smelting and refining, bronze foundry, casting shop.

The **McQuay-Norris Manufacturing Company,** Cooper and Southwest Avenues, St. Louis, Mo., manufacturer of piston rings, etc., has leased a portion of the building at 12th and Hamilton Streets, Philadelphia, Pa., for a factory branch and distributing plant.

The **W. N. Best Corporation,** New York, has removed its general headquarters from 11 Broadway to Greeley Square Building, Sixth Avenue and Thirty-first Street, where they

occupy the entire 23rd floor, operating an engineering and drafting department.

N. N. Hill Brass Company, East Hampton, Conn., announces that the report, published in another journal, that they will build a hydroelectric plant on the site of their old power house is incorrect, as they are not making any improvements at this time.

C. J. Haas, 173 West Broadway, New York, manufacturer of Triumph Harps, which are used as lamp shade holders, metal specialties, lamp shades, etc., has leased the two-story factory, 50 x 100 ft., at 308-10 Thirteenth Street, West New York, N. J., where he is now located.

The **International Silver Company,** Meriden, Conn., has plans for a one-story addition to its plant at Bridgeport, Conn., 50 x 108 ft., saw-tooth roof type, to cost about $30,000. This addition will be used for the expansion of press and rolling departments, and a new annealing room.

The **Kewaskum, Wis., Aluminum Company,** manufacturer of utensils, novelties and other drawnware, has postponed until July or August its proposed construction of a two-story addition, 50 x 100 ft. This firm operates the following departments: spinning, stamping, tinning, polishing.

The **Ohio Bronze Powder Company,** 1120 East 152nd Street, Cleveland, Ohio, announces that the fire which damaged their aluminum plant did not affect their gold bronze plant. They still have a large stock of aluminum powder in their warehouse which will permit them to fill their orders regularly.

Neemes Foundry, Inc., Troy, N. Y., is now engaged in the manufacture of brass, gun metal, aluminum and bronze. The firm has acquired two parcels of land at 206 First Street, together with two buildings standing thereon, and also a lot about 30 x 100 ft. Several sets of plans have been prepared for expansion.

General offices of the **American Mond Nickel Corporation** have been transferred from Clearfield, Pa., where their plant is located, to the Century Building, Pittsburgh. Grant B. Shipley, of Pittsburgh, is chairman of the board of directors. This firm operates the following departments: tool room, casting shop, rolling mill, plating.

The **Benjamin Richards Company,** Lake Street, Winsted, Conn., plant, formerly used for the manufacture of curtain rods and hardware, is being remodeled by a new company for the manufacture of enameled insulated wire. James E. Sweet, formerly secretary Strand and Sweet Manufacturing Company, will head the new organization.

The **Air Reduction Company, Inc.,** has acquired the **Interstate Oxygen Company,** a West Virginia corporation with oxygen plants at Wheeling, W. Va., and Steubenville, Ohio, and Portsmouth, Ohio, and the Compressed Gas Manufacturing Company, also a West Virginia corporation having an acetylene plant at Huntingdon, W. Va.

The **Nuss Manufacturing Company,** Cameron and Mulberry Streets, Harrisburg, Pa., operating a mechanical and plating works, has preliminary plans for a three-story addition for the manufacture and repair of automobile radiators, to cost close to $45,000 with equipment. This firm operates the following departments: plating, soldering, polishing, lacquering.

The **Permway Manufacturing Company,** formerly Permway Electric Manufacturing Company, St. Charles, Mo., has been re-organized with a capital of $125,000 to manufacture electrical household appliances. The company is in the market for equipment for plating and polishing departments. The following departments are operated: tool room, plating, stamping, polishing, lacquering.

The **Prest-O-Lite Company** announces the sale of the Storage Battery Branch of its business to a new company, **Prest-O-Lite Storage Battery Corporation.** The entire capital stock of the purchasing company is owned by the Automotive Battery Corporation of New York. That portion of the Indianapolis plant of the Prest-O-Lite Company, Inc., used for the manufacture of storage batteries has been leased to the new company.

Elkhart Brass Manufacturing Company, Elkhart, Ind., has increased its capital stock from $150,000 to $250,000, increase of $100,000 being common stock. The company also filed certificate redeeming $4,000 preferred stock. This firm operates the following departments: brass, bronze and aluminum foundry, brass machine shop, tool room, casting shop, brazing, plating, japanning, tinning, soldering, polishing.

The **Zapon Company** announces the removal of its general sales offices from 247 Park Avenue, New York City, to its plant at Stamford, Connecticut, where a large administration office building has recently been constructed. The office and warehouse of the Zapon Company, at 547 Greenwich Street, New York City, in charge of H. W. McGovern, will continue to serve the metal, doll, toy and composition industries in the Metropolitan District. A suite of offices will be maintained at 247 Park Avenue, New York City.

The **W. Green Electric Company** is removing to new quarters, 182 Broadway, corner John Street, New York, where their new premises are being fitted up exclusively as a showroom for the exhibition of their polishing, buffing and grinding motors, electro plating machines and generator sets and electro plating salts. They will have a special department for demonstrating and teaching the trade, without any charge, the correct, professional and up-to-date methods of electro plating in gold, silver, platinum, copper and nickel.

BUSINESS TROUBLES

The **Die Cast Art Bronze Corporation,** Jamestown, N. Y., has made a general assignment for the benefit of creditors. This assignment is the outcome of the death, some time ago, of the two principal stockholders of the company; and the necessity, therefore, of a complete reorganization.

At a meeting of the principal creditors of the **J. W. Paxson Company,** Philadelphia, Pa., held Tuesday, April 19, 1927, a committee was appointed, with full power to act for the best interests of the creditors looking to the payment of their claims insofar as possible. For some time past it has become increasingly apparent that unless additional capital was placed in the business it would be impossible for the company to continue operations. As new money was not forthcoming a meeting of the principal creditors was called, and they unanimously approved the appointment of such a committee.

NEW INCORPORATIONS

Aluminum Industries, Inc., Cincinnati, Ohio, has been incorporated with $250,000 capital to refine and smelt aluminum and its alloy for the foundry trade, and permanent mold castings and sand castings for the automobile trade.

The **Acme Mill and Foundry Supply Company,** Milwaukee, Wis., has been incorporated with $10,000 capital stock and is establishing an office and warehouse at 4409 State Street, to deal in new and waste materials, scrap metals, etc. The principals are Harry Pokrass, Luis Smoller and Phineas Smoller.

The **Metal Products Inc.,** Milwaukee, Wis., has been incorporated with $25,000 capital stock to manufacture electrical signs and other metal specialities. The plant is located at 1856 Brown Street. The principals are Charles J. Wamser, Richard von Zakobiel and Frank W. Wamser. This firm will operate the following departments: stamping, tinning, soldering.

METAL STOCK MARKET QUOTATIONS

	Par	Bid	Asked
Aluminum Company of America	..	$65	$69
American Hardware Corporation	$100	83	85
Anaconda Copper	50	45½	46
Bristol Brass	25	4	8
International Nickel, com.	25	56	56¼
International Nickel, pfd.	100	104	..
International Silver, com.	100	162	164
International Silver, pfd.	100	116½	..
National Enameling & Stamping	100	20	20¼
National Enameling & Stamping, pfd.	100	69½	70
National Lead Company, com.	100	193½	195
National Lead Company, pfd.	100	129½	130
New Jersey Zinc	100	190	192
Rome Brass & Copper	100	132	142
Scovill Manufacturing Company	..	55	57
Yale & Towne Mfg. Company	..	73	75

Corrected by J. K. Rice, Jr., Co., 120 Broadway, New York.

Review of the Wrought Metal Business

Written for the Metal Industry by J. J. WHITEHEAD, President of the Whitehead Metal Products Company of New York, Inc.

MAY 2, 1927.

A reduction of ¼c per pound in the price of brass and copper, rods, sheet, tube and wire, which became effective on April 7th, was the only change to be noted in this industry during the entire month. The mills all seem to be operating with a comfortable margin on their order books, although there were no outstanding features of great activity in any of the lines consuming non-ferrous metals, with the exception of the refrigerator industry.

At the end of March the manufacturers of ice cream cabinets and household refrigerators opened up manufacturing facilities in full, and commenced to draw very heavily upon the manufacturers of sheet copper, copper tubing and Monel metal. The added tonnage from this industry, which has been greatly in excess of last year's heavy requirements, has been more than sufficient to compensate for the slight relaxation in demands from other lines. The mills which have been favored with tonnage from the refrigerating device manufacturers, find themselves with an extremely large volume of business on their order books.

The demand for brass pipe for plumbing work throughout the country and especially in the New York district continues at an unprecedented rate. Practically all of the new hotels and large apartment houses are being equipped throughout with brass pipe in plumbing, and as most of these buildings are being rushed for Fall completion, the demand for brass pipe from this source alone is extremely heavy.

The suburban building trade has been rather late in getting started, and so far this year has been a disappointment. Although the activity in this field could not properly be described as an unhealthy condition, nevertheless, there has not been the enormous volume of business this year which characterized the past two or three Spring seasons. It is felt, however, that there is still a very healthy demand for suburban homes, and that there is nothing in the situation to develop a pessimistic feeling, or to indicate that the business is likely to see a severe slump.

With the enormous demand from the refrigerator industry for Monel metal, which has now been developed into orders for several million pounds of sheet, the producers of this metal have found themselves literally swamped with business. In addition to this item, the largest manufacturer of soda fountains in the country has placed orders for heavy tonnages of Monel metal for covering certain cabinets, requiring shipments of several carloads each month for the next six months. The heavy demand for Monel metal and pure nickel from the hotel and restaurant trade has not only continued, but greatly increased, and the requirements of the engineering and chemical trade have continued at a very high rate. The result is that new facilities which were constructed and placed in operation during the past few months are now completely engaged, and a prosperous year for these manufacturers is guaranteed.

Throughout the entire trade there appears to be a feeling of general satisfaction with the conditions, and no serious complaints regarding business conditions have been registered.

Metal Market Review

Written for The Metal Industry by R. J. HOUSTON of D. Houston & Company, Metal Brokers, New York

COPPER

MAY 2, 1927.

Consumption of copper continues in large volume and fabricating operations are well maintained. Domestic deliveries for the first quarter of this year amounted to 446,020,000 pounds, and compared with domestic deliveries of 420,176,000 pounds for the previous three months, being an increase of 25,844,000 pounds. A year ago, however, American consumers took 453,616,000 pounds of copper during the first quarter of 1926, or 7,596,000 pounds more than for the corresponding period this year.

Market movements during the past month showed a fairly good business within the range of 13@13⅛ cents delivered to Connecticut Valley points. A good volume of European orders were also taken at 13.35 cents and later at 13.50 cents c. i. f. foreign ports.

The market for copper closes easy at 13 cents delivered to Connecticut Valley points. The European price has been reduced from 13.50 cents to 13.35 cents c. i. f. foreign points.

ZINC

April brought a further decline in zinc, and recent business was at the sacrifice of prices. The downward trend of the market established new low levels for the year, with business in prime Western brands at 6.12½ cents East St. Louis basis. Heavy production has led to frequent cuts in prices lately, and because of heavy output consumers are following a cautious policy in covering requirements. There was an increase of domestic stocks in March, amounting to 3,341 tons. Stocks at smelters on April 1 were 36,279 tons, and compared with 20,561 tons on April 1, 1926, an increase in 12 months of 15,718 tons.

TIN

The tin situation was conspicuous for weakness lately and market prices suffered a substantial net loss during the past month. Liquidation of holdings in London and bear pressure by operators caused a series of pronounced breaks which sent the price of spot Straits down to 66⅜ cents compared with 70 cents early in April and 71 cents in February. The reaction may be regarded as an overdue correction of speculative excesses. There is, however, a strong technical position which makes the tin market subject to sudden and spectacular changes, and it is a safe assumption that erratic conditions will continue to mark the movements of tin through the coming months.

The low point established this year was 64⅞ cents in January. Supply and demand are so nearly balanced that the price has been advanced to an abnormally high level on the statistical position. There is no indication that production will be increased to a great extent, and unless consumption suffers a general slump there is little prospect of seeing the low prices of 1921 and 1922. Market closes firm at 66¾ cents bid for spot Straits.

LEAD

There was quite active buying at the beginning of April on the basis of 7.05 cents to 7.07½ cents St. Louis terms. A reduction in price to 7.25 cents New York basis soon followed, however, and the downward revision caused buyers to hesitate in placing further heavy orders. The situation became rather uncertain, and demand lost momentum and settled down to the hand-to-mouth basis. A further reduction in price to 7.15 cents New York was made on April 18, and another downward revision to 7.00 cents New York was made on April 20. This latter price has been shaded and tone of market was easy with impressions that the declining tendency was not over yet. Consumption of lead has been large this year, but it is less than the 1926 rate and has not kept pace with production.

ALUMINUM

There was an active demand for aluminum last month. Producers and importers did a good volume of business, and numerous orders have given good support to the market. Prices are consequently firm, and with a falling off in recent imports domestic conditions are highly favorable for market stability. Expansion in European consumption is also expected which may leave a smaller tonnage of foreign ingots available for this country. Imports of aluminum from abroad in 1926 amounted to 74,880,787 pounds, compared with 43,409,546 pounds in 1925. The imports

of aluminum into the United States in February were only 2,741,732 pounds, as against 7,519,283 pounds in January. Present prices of aluminum are 25½ cents to 26 cents for virgin ingot 99 per cent plus and 25.30 cents to 25.80 cents for 98-99 per cent grade.

ANTIMONY

There was recent active trading in antimony, with sales for June-July arrival at 12.50 cents c. i. f. New York. Sellers later advanced price to 12.75 cents c. i. f. New York, being equal to 14.75 cents duty paid. A short time ago the price touched 15.37½ cents for June-July arrival at New York, duty paid. The market turned easy since then on free offerings of spot regulars, but later tendency showed a firmer undertone on advices of an increase of the export duty from China. Unsettled conditions in China cloud the outlook more or less as to the probable course of the antimony market.

QUICKSILVER

The position of quicksilver continues very strong, and sellers have been able to obtain full prices. Import costs of quicksilver are said to be about $125 per flask, with restricted offerings. There are reports of underproduction throughout the world, and the trade are inclined to expect continued high prices for some time. Sales were reported as high as $126 per flask. The present level is the highest since 1918.

PLATINUM

Market tone for platinum is easier, with refined quoted at $91 per ounce. Recent demand was moderate and sales were made at concessions.

SILVER

The market for silver has reached a stage where narrow price fluctuations prevail despite the low quotations for the white metal. China and India are always large factors in the situation, but the unsettled conditions in China do not provide the normal basis for business in any commodity with that great center of consumption. However, China and India have shown some interest, as both buyers and sellers, but the effect did not produce any permanent improvement in prices. In the first half of April the domestic price touched 57¼ cents, but at this writing the official quotation is 55⅞ cents per ounce. The financial difficulties in Japan are supposed to have led to some operations in silver against yen. Silver reserves in the Orient are large, and the uncertainties in the Far East are a decidedly detrimental phase in the current situation.

OLD METALS

A lower tendency has been developed in the market for old metals owing to the downward trend for copper, lead and zinc. Foreign demand has been maintained at an active rate for desired grades and packing. The movement on domestic account was on a fair scale, but for some material easier terms were available. Consumers are understood to be carrying light stocks, and new requirements are expected to be maintained in good volume. Prices dealers pay are reported at 10¾@11 cents for heavy copper, 9¼@9½ cents for light copper, 7@7¼ cents for light brass, 8¾@9 cents for new brass clippings, 5¾@5⅞ cents for heavy lead, 4 cents for old zinc, and 19@19½ cents for aluminum clippings.

Daily Metal Prices for the Month of April, 1927

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	4	5	6	7	8	11	12	13	14	15	18
Copper (f. o. b. Ref.) c/lb. Duty Free												
Lake (Delivered)	13.375	13.25	13.25	13.25	13.25	13.25	13.125	13.125	13.125	13.125	...	13.25
Electrolytic	13.00	13.00	13.00	13.00	12.925	12.925	12.875	12.875	12.875	12.875	...	13.00
Casting	12.75	12.75	12.875	12.875	12.875	12.875	12.75	12.75	12.75	12.75	...	12.85
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	6.575	6.575	6.55	6.50	6.50	6.50	6.40	6.40	6.40	6.40	...	6.40
Brass Special	6.625	6.625	6.625	6.575	6.55	6.55	6.45	6.45	6.45	6.45	...	6.45
Tin (f. o. b., N. Y.) c/lb. Duty Free												
Straits	69.00	70.00	69.50	69.50	69.25	68.50	68.00	67.875	68.125	68.125	...	68.625
Fig 99%	67.375	68.00	67.75	67.625	67.375	67.00	66.50	66.375	66.625	66.625	...	66.625
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	7.10	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	7.00	...	6.925
Aluminum c/lb. Duty 5c/lb	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	...	26.00
Nickel c/lb. Duty 3c/lb.												
Ingot	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	...	35.00
Shot	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00	...	36.00
Electrolytic	39.00	39.00	39.00	39.00	39.00	39.00	39.00	39.00	39.00	39.00	...	39.00
Antimony (J. & Ch.) c/lb. Duty 2c/lb	13.25	13.25	13.00	12.75	13.00	13.50	14.50	14.75	15.00	15.00	...	15.00
Silver c/oz. Troy Duty Free	56.50	56.50	57.00	57.25	57.125	56.625	57.00	56.50	56.25	56.25	...	56.875
Platinum $/oz. Troy Duty Free	102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00	102.00	99.00	...	99.00

	19	20	21	22	25	26	27	28	29	High	Low	Aver.
Copper (f. o. b. Ref.) c/lb. Duty Free												
Lake (Delivered)	13.25	13.25	13.25	13.25	13.25	13.125	13.125	13.125	13.125	13.375	13.125	13.206
Electrolytic	13.00	13.00	13.00	13.00	13.00	12.875	12.875	12.875	12.875	13.00	12.875	12.943
Casting	12.85	12.90	12.90	12.90	12.90	12.80	12.80	12.80	12.80	12.90	12.75	12.825
Zinc (f. o. b. St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	6.40	6.35	6.30	6.25	6.15	6.125	6.125	6.15	6.125	6.575	6.125	6.359
Brass Special	6.45	6.40	6.35	6.30	6.30	6.175	6.175	6.20	6.175	6.625	6.175	6.416
Tin (f. o. b., N. Y.) c/lb. Duty Free												
Straits	68.625	68.125	67.00	66.75	66.375	66.75	67.125	67.00	66.125	70.00	66.125	68.019
Fig 99%	66.625	66.00	65.00	64.625	64.00	64.25	64.75	64.50	63.75	68.00	63.75	66.069
Lead (f. o. b. St. L.) c/lb. Duty 2½c/lb.	6.875	6.75	6.70	6.60	6.60	6.60	6.60	6.50	6.50	7.10	6.50	6.838
Aluminum c/lb. Duty 5c/lb	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00	26.00
Nickel c/lb. Duty 3c/lb.												
Ingot	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00	35.00
Shot	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00	36.00
Electrolytic	39.00	39.00	39.00	39.00	39.00	39.00	39.00	39.00	39.00	39.00	39.00	39.00
Antimony (J. & Ch.) c/lb. Duty 2c/lb	15.50	15.25	15.00	14.625	14.625	14.50	14.50	14.00	13.25	15.50	12.75	14.13
Silver c/oz. Troy Duty Free	56.625	56.50	56.50	56.50	56.00	56.00	55.875	55.875	55.75	57.25	55.75	56.475
Platinum $/oz. Troy Duty Free	99.00	99.00	96.00	96.00	91.00	91.00	90.00	89.00	89.00	102.00	89.00	97.5

Metal Prices, May 2, 1927

NEW METALS

Copper: Lake, 13.125. Electrolytic, 12.875. Casting, 12.625.
Zinc: Prime Western, 6.125. Brass Special, 6.175.
Tin: Straits, 67.00. Pig, 99%, 64.75.
Lead: 6.45. Aluminum, 26.00. Antimony, 13.00.
Nickel: Ingot, 35. Shot, 36. Elec., 39. Pellets, 40.
Quicksilver: flask, 75 lbs. $125.00. Bismuth, $2.20 to $2.25.
Cadmium, 60. Cobalt, 97%, $2.60. Silver, oz., Troy, 55.75.
Gold, oz., Troy, $20.67. **Platinum,** oz., Troy, $89.00.

INGOT METALS AND ALLOYS

Brass Ingots, Yellow	10 to11
Brass Ingots, Red	12 to13
Bronze Ingots	13 to14½
Casting Aluminum Alloys	21 to24
Manganese Bronze Castings	23 to40
Manganese Bronze Ingots	13 to16½
Manganese Bronze Forging	32 to40
Manganese Copper, 30%	25 to35
Monel Metal Shot	28
Monel Metal Blocks	32
Parsons Manganese Bronze Ingots	18¼to19¾
Phosphor Bronze	13½to15
Phosphor Copper, guaranteed 15%	18⅞to22½
Phosphor Copper, guaranteed 10%	18 to21½
Phosphor Tin, guaranteed 5%	70 to80
Phosphor Tin, no guarantee	70 to80
Silicon Copper, 10%....according to quantity....	28 to32

OLD METALS

Buying Prices		Selling Prices
11¼to11¾	Heavy Cut Copper	12¾to13¼
10¾to11¼	Copper Wire	12¼to12½
9¼too 9¾	Light Copper	10¾to11
9 to 9½	Heavy Machine Composition	10 to10¼
7½to 7¾	Heavy Brass	8¾to 9
6¼to 6½	Light Brass	7½to 7¾
7¼to 7½	No. 1 Yellow Brass Turnings	8¾to 9¼
8¼to 8¾	No. 1 Composition Turnings	9¼to10¼
6¼to 6½	Heavy Lead	7¼to 7½
4¼to 4½	Zinc Scrap	5¼to 5¾
10 to11	Scrap Aluminum Turnings	13 to15
14½to15	Scrap Aluminum, cast alloyed	18 to19
20 to20½	Scrap Aluminum, sheet (new)	22½to23
38 to40	No. 1 Pewter	42 to44
12	Old Nickel Anodes	14
18	Old Nickel	20

Wrought Metals and Alloys

COPPER SHEET

Mill shipments (hot rolled) ..... 20¾c. to 21¾c. net base
From stock ..... 21¾c. to 22¾c. net base

BARE COPPER WIRE

15⅛c. to 15⅜c. net base, in carload lots.

COPPER SEAMLESS TUBING

23¾c. to 24¾c. net base.

SOLDERING COPPERS

300 lbs. and over in one order.....20¼c. net base
100 lbs. to 200 lbs. in one order.....20¾c. net base

ZINC SHEET

Duty sheet, 15% Cents per lb.
Carload lots, standard sizes and gauges, at mill, less 8 per cent discount ..... 9.75 net base
Casks, jobbers' price.....10.50 net base
Open Casks, jobbers' price.....11.00 to 11.25 net base

ALUMINUM SHEET AND COIL

Aluminum sheet, 18 ga., base price..... 38c.
Aluminum coils, 24 ga., base price..... 34.7c.
Foreign ..... 40c.

ROLLED NICKEL SHEET AND ROD

Net Base Prices

Cold Drawn Rods..... 53c. Cold Rolled Sheet..... 60c.
Hot Rolled Rods..... 45c. Hot Rolled Sheet..... 52c.

BLOCK TIN SHEET

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 10c or over Pig Tin; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 17c. over; less than 25 lbs., 25c. over.

SILVER SHEET

Rolled sterling silver 57½ to 59½.

BRASS MATERIAL—MILL SHIPMENTS

In effect April 7, 1927
To customers who buy 5,000 lbs. or more in one order.

	Net base per lb. High Brass	Low Brass	Bronze
Sheet	$0.18⅛	$0.19¼	$0.21⅝
Wire	.18⅜	.20⅛	.22⅛
Rod	.15⅞	.20⅜	.22⅜
Brazed tubing	.26⅛	.....	.31⅜
Open seam tubing	.26⅛	.....	.31⅜
Angles and channels	.29⅛	.....	.34⅜

For less than 5,000 lbs. add 1c. per lb. to above prices.

BRASS SEAMLESS TUBING

23c. to 24c. net base.

TOBIN BRONZE AND MUNTZ METAL

Tobin Bronze Rod..... 20⅛c. net base
Muntz or Yellow Metal Sheathing (14"x48") 18⅛c. net base
Muntz or Yellow Rectangular sheet other Sheathing ..... 19⅛c. net base
Muntz or Yellow Metal Rod..... 16⅛c. net base
Above are for 100 lbs. or more in one order.

NICKEL SILVER (NICKELENE)

Net Base Prices

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	26 c.	10% Quality	29 c.
15% "	27½c.	15% "	32¾c.
18% "	28¾c.	18% "	36 c.

MONEL METAL SHEET AND ROD

Hot Rolled Rods (base) 35 Hot Rolled Sheets (base) 42
Cold Drawn Rods (base) 43 Cold Rolled Sheets (base) 50

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 8c. over N. Y. tin price; 100 lbs. to 500 lbs., 10c, over; 50 to 100 lbs., 15c. over; 25 to 50 lbs., 20c. over; less than 25 lbs., 25c. over. Prices f. o. b. mill.

Supply Prices, May 2, 1927

ANODES

Copper: Cast	20c.	per lb.	
Rolled	19⅜c.	per lb.	
Electrolytic	20c.	per lb.	
Brass: Cast	19c.	per lb.	
Rolled	19⅜c.	per lb.	
Zinc: Cast	13¾c.	per lb.	

Nickel: 90-92%	45c.	per lb.
95-97%	47c.	per lb.
99%	49c.	per lb.

Silver: Rolled silver anodes .999 fine are quoted from 59c. to 61c. per Troy ounce, depending upon quantity purchased.

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 100 lbs.	100 to 200 lbs.	Over 200 lbs.
10-12-14 & 16"	1" to 3"	$3.00/lb.	$2.75/lb.	$2.65/lb.
6-8 & over 16	1 to 3	3.10	2.85	2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 up to 6	¼ to 3	4.85	4.85	4.85
4 up to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

Grey Mexican Wheel deduct 10c per lb. from White Spanish prices.

COTTON BUFFS

Full Disc Open buffs, per 100 sections.

12" 20 ply 64/68 Unbleached	$27.65-28.85
14" 20 ply 64/68 Unbleached	35.55-35.90
12" 20 ply 80/92 Unbleached	29.50
14" 20 ply 80/92 Unbleached	40.00
12" 20 ply 84/92 Unbleached	34.25-40.50
14" 20 ply 84/92 Unbleached	46.40-54.20
12" 20 ply 80/84 Unbleached	35.40-36.50
14" 20 ply 80/84 Unbleached	48.00-49.15

Sewed Pieced Buffs, per lb., bleached 60-75c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.11–.16
Acid—Boric (Boracic) Crystals	lb.	.12
Chromic	lb.	.32
Hydrochloric (Muriatic) Tech., 20°, Carboys	lb.	.02
Hydrochloric, C. P., 20 deg., carboys	lb.	.06
Hydrofluoric, 30%, bbls	lb.	.08
Nitric, 36 deg., carboys	lb.	.06
Nitric, 42 deg., carboys	lb.	.07
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl	lb.	.18½–.23
Denatured, bbls.	gal.	.51
Alum—Lump, Barrels	lb.	.03¼
Powdered, Barrels	lb.	.042
Aluminum sulphate, commercial tech.	lb.	.02⅜
Aluminum chloride solution in carboys	lb.	.06½
Ammonium—Sulphate, tech. bbls	lb.	.03¾
Sulphocyanide	lb.	.65
Arsenic, white, kegs	lb.	.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.60
Borax Crystals (Sodium Biborate), bbls	lb.	.04½
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.06
Chrome Green, bbls	lb.	.29
Chromic Sulphate	lb.	.37
Copper—Acetate (Verdegris)	lb.	.37
Carbonate, bbls.	lb.	.17
Cyanide (100 lb. kegs)	lb.	.50
Sulphate, bbls.	lb.	.05½
Cream of Tartar Crystals (Potassium bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05–.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$75.00
Fusel Oil	gal.	$4.45
Gold Chloride	oz.	$14.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.59–.61

Iron, Sulphate (Copperas), bbl.	lb.	.01½
Lead Acetate (Sugar of Lead)	lb.	.13¼
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Nickel—Carbonate dry, bbls	lb.	.29
Chloride, bbls.	lb.	.17–.21
Salts, single 300 lb. bbls	lb.	.10½
Salts, double 425 lb. bbls	lb.	.10
Paraffin	lb.	.05–.06
Phosphorus—Duty free, according to quantity		.35–.40
Potash, Caustic Electrolytic 88-92% broken, drums	lb.	.09¼
Potassium Bichromate, casks (crystals)	lb.	.08½
Carbonate, 96-98%	lb.	.07
Cyanide, 165 lb. cases, 94-96%	lb.	.57½
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in casks	lb.	.06
Silver Chloride, dry	oz.	.86
Cyanide (fluctuating)	oz.	.60
Nitrate, 100 ounce lots	oz.	.40½
Soda Ash, 58%, bbls.	lb.	.02½
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.20
Hyposulphite, kegs	lb.	.04
Nitrate, tech., bbls.	lb.	.04¼
Phosphate, tech., bbls.	lb.	.03¼
Silicate (Water Glass), bbls	lb.	.02
Sulpho Cyanide	lb.	.45
Sulphur (Brimstone), bbls	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.47
Tripoli, Powdered	lb.	.03
Wax—Bees, white ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½–.06
Zinc, Carbonate, bbls	lb.	.11–.12
Chloride, casks	lb.	.06¼
Cyanide (100 lb. kegs)	lb.	.41
Sulphate, bbls.	lb.	.03½